Project Number: JAG-IQP-8004

TEACHING SCIENCE AT DOHERTY MEMORIAL HIGH SCHOOL

An Interactive Qualifying Project Report:

submitted to the Faculty

of the

WORCESTER POLYTECHNIC INSTITUTE

in partial fulfillment of the requirements for the

Degree of Bachelor of Science

By

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Date: October 14, 2007

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Chapter One: Background Information

Doherty Memorial High was opened in 1966 and has not gone under many renovations. During the last 10 years, an upgrade was announced; however, when carried out, it fell well below expectations. Drop ceilings were installed to cover the old dilapidated ceilings, the floors were buffed, a six foot power strip was added to the front of the room to create 6 more outlets, and a new coat of paint was put on the walls and cabinets. Also, the boiler to heat the school was replaced at a high cost and, when completed, was simply connected to the old system. In all of the years Doherty has been open, chalk dust has settled into the vents. When the new boiler was attached to the old vents exhausts were created to let off excess heat. Because of this, when it rained or snow melted on the roof water, heavy with chalk dust, fell from the ceiling vents for nearly 5 years. Finally, due to the high number of students ill affected by chalk dust, all of the school's chalkboards were replaced with whiteboards.

According to the 2005 US Census, the most recent census conducted in the United States, the city of Worcester has 175,898 residents. Approximately 20% of this population is school age children, with 23,603 students enrolled in Worcester Public Schools (WPS) for the 2006-2007 school year. The WPS system is comprised of 44 schools, 7 of which are secondary schools teaching grades 7-12. Doherty Memorial High is located in the eastern part of the city and, in the 06-07 school year, served 1,560 students.

The makeup of the student body is diverse with students from many different nationalities and cultures. 52% of students are Caucasian, 27% are Hispanic, 14% are African American, and 6% are Asian. The remaining students are Native American or Multi-Race, Non-Hispanic. 40% of the students come from low income households typically mal nourished in some way because of this. The school offers breakfast everyday and provides either reduced price lunch or free lunch for these students. Among the student body the male to female ratio is 1:1 with a slightly larger female population. Of the students at Doherty High, 13% are special needs,

slightly less than the district wide 19%. Nearly 90% of each graduating class plans to attend some form of post-secondary schooling, most plan to attend a four year college.

One principal and 4 assistant principals serve as the school's uppermost administrators. Each student is assigned one of the four assistant principal and keeps that assignment for the duration of their time spent at Doherty. All disciplinary action is carried out through the student's assistant principal. There are several levels of discipline that are used. In order of severity there are office detentions for which a student must report after school to a designated room. For slightly greater offenses, an overnight suspension is given, for which the students cannot return to the school without a parent coming to school. Most parents will come the day following the receipt of the suspension notice, so no school is missed. A student may also be given in house suspension for which they are sent to a separate room for the duration of the school day. The minimum length for this punishment is 3 days. After three days a parent may come in and get the student out of in house suspension and return them to regular classes. If it is determined that the infraction requires a more severe punishment an out of school suspension is issued. For this a student may not return to the school for the specified number of days, which can range anywhere from 1-10 days and even longer. Once the suspension is fulfilled a parent must come in with the student to readmit the student. Finally, the most severe punishment is expulsion from the school. This begins with a 10 day out of school suspension followed by an expulsion hearing. If the initial assessment of a need for expulsion is upheld, the student will not be allowed to return to the school. If the initial ruling is overturned the student may return to classes.

Doherty High employs 93 teachers in a variety of subjects, 94% of these teachers are licensed in the area of their teaching assignment. With 93 teachers the resulting student teacher ratio is 16:1. The average salary for these teachers was $53,000 in 2006, with newer teachers at the low end of the pay scale and teachers with a longer time spent in the district at the higher end of the scale. Brian King, the teacher at Doherty serving as the mentor for the project is in his tenth year of teaching at Doherty. He teaches Biology Honors and Vertebrate Anatomy Honors.

The Biology class is 29 students who are mostly freshmen, although there are 3 sophomores in the class. He began the year with 30 but recently lost a student due to expulsion. 2nd, 4th, 5th, and 6th periods are Anatomy with 23, 22, 22, and 14 students, respectively, and are evenly split between the Junior and Senior classes. This creates a student teacher ratio slightly higher than the schools ratio.

In 2006, 367 Doherty students took the Massachusetts Comprehensive Assessment System (MCAS) test. Table 1 illustrates the Doherty MCAS scores compared to the state scores.

Table 1: MCAS Test Results - Spring 2006

	Advanced/ Above Proficient (%)		Proficient (%)		Needs Improvement (%)		Warning/ Failing (%)	
	Doherty	State	Dohert y	State	Doherty	State	Dohert y	State
English & Language Arts	7	16	49	53	37	24	7	7
Mathematics	25	40	25	27	30	21	20	12

In English, Doherty students are close to the state wide results, while in Mathematics, the school is below state level in terms of students in the Proficient, Advanced ranking. Students who are currently sophomores being graduated in 2009, and all students after, will need to also pass the science portion of the MCAS Test to graduate. The science portion is either biology or chemistry, depending on the school district and which subject is taught sophomore year. Because of this new standard, Doherty is allowing freshmen to opt to take the MCAS Test at the end of freshmen year as this is when they complete biology. Students can also take the chemistry exam at the end of sophomore year, needing to pass only one. The 3 sophomores in Mr. King's Biology Class will be required to take the biology exam this spring.

Chapter Two: Courses Taught

The city of Worcester requires high school student attending public schools to complete an equivalent of 2 years of science courses. At Doherty Memorial High School (DMHS) the typical track is as follows. Students entering grade 9 are placed into a biology course based on science aptitude shown in previous courses. If the student has shown to excel in the life sciences, he or she is placed at the honors level; if the student has shown to be at an average level they are placed into Level 1. Students who have struggled with the life sciences in the past are placed into a two year biology course. This two year course covers the same amount of material the honors and Level 1 courses cover in one year, spreading the material equally over the 9th and 10th grades. Biology is used as a test for the students' preparedness to move onto chemistry, the next course in the science series at DMHS.

Chemistry is taught to most students at the 10th grade level. The placement of the students is dependant on his/her grades both in Biology and Mathematics. Only students who have succeeded in both areas of study during Grade 9 may be placed into the honors level of chemistry. All others are placed into Level 1. Students completing the two year Biology path are often not equipped to enter chemistry and will move on to another science option in the 11th grade, only after completing both years of Biology, thus skipping the chemistry course.

In the 11th grade, students may choose their science course. Students may enter into Human Vertebrate Anatomy or Physics. Both of these courses have historically been offered at only the honors level. Students may also choose to not enter into a science course in the 11th grade and may opt to take another year of science in the 12th grade. Therefore, both Physics and Anatomy are taught to a mix of 11th and 12th graders.

During the 2006-2007 school year, Brian King taught a total of 5 courses per day. One Honors Level 9th grade Biology Course and 4 Honors Level 11th/12th Grade Human Vertebrate Anatomy Courses. I began teaching only Biology for the start of my first week teaching. In the

second half of the week, I started teaching each of the Anatomy classes. The sections covered by my lectures in the Biology course were: DNA and gene technology, theories of evolution, and the classification and organizing of organisms. The body systems covered by my lectures in Vertebrate Anatomy were: the Respiratory System, the Digestive System, and the Lymphatic System.

For my Biology students I stressed the basic biological principles that would serve as a foundation in later courses in the students' paths of study. Concepts such as the scientific theory and the structure of cells and DNA were stressed in each section when applicable. Because these ideas are at the core of the Science Curriculum at DMHS, I continually stressed the points relating them back to previous sections. For example, when teaching the chapter on DNA technology, I made sure to break it down to the structural level, reinforcing the information they had learned previously in the year. Without the foundation of the structural design of a strand of DNA and the process to make a strand of DNA, the students would not have understood the process of cutting and moving a piece of DNA from one organism to another. Later in the course of study for the sciences, students would learn about the chemical make-up of the parts of the cell. Because they have an understanding of the cell's structures, including DNA, they will better understand chemical compounds within the body.

With my vertebrate anatomy students, references were often made to their previous courses as DMHS. When teaching the respiratory system, we discussed the mechanisms of breathing. A breath of air is taken in or expel due to changes in Pressure and Volume. This is a principle the students would have learned in their chemistry course in a previous year. However, many students did not remember the answer when the following question was asked: *When volume decreases, what happens to pressure?* However, after a student answered correctly many of his or her classmates remembered learning this principle previous to this course and found it easier to understand the material. Because of the course sequence in the DMHS science curriculum, the students are able to better understand more complex principles in Human

Anatomy based on their knowledge gained in Biology, Chemistry, and any other course they may have taken.

` This course sequence, however, is being modified as funding for the school is pulled back and courses are eliminated. Because courses are being removed from the school's curriculum, leaving fewer options for students who do not excel in the sciences, more students are finding their way into the science courses to fill their schedules and obtain enough credits to graduate. Because of this, a percentage of the students in the honor anatomy classes are actually below the honors level but have only honors physics as an alternative. Because of this DMHS will be offering Human Vertebrate Anatomy at a lower level starting in the 2007-2008 year.

The course of study laid out at DMHS conformed to the standards set forth by the Massachusetts Department of Education. Starting in biology and continuing through the entire science program, scientific skills area taught in addition to the course material for the particular class a student is enrolled in. For example, a student in a chemistry course learns about elements and the layout of electrons. This serves at a foundation for chemical compounds and chemical reactions. These reactions are then taught using math, lab skills, and knowledge learned in past classes such as biology. They must use math to figure how much of each element they will need to create the desired outcome, use their lab skills to conduct safe and efficient experiments that show the chemical reactions, and use basic knowledge from past classes such as all things contain matter. The biology and chemistry courses fulfill all of the needs set by the Massachusetts Educational Standards, and the physics and anatomy courses further enhance these standards for student hoping to continue on a scientific course after they are graduated from high school.

Chapter Three: Class Materials

I began my observation of Brian King's courses in late October 2006, observing a several days a week for a 2 to 3 hours. In March of 2007, I began teaching his classes, starting first with Biology. At the end of my first week teaching I took over all five of his classes, teaching one biology course and 4 vertebrate anatomy classes all at the honors level. Taking over his classes, I chose to follow Mr. King's classroom structure and his style of teaching for several reasons. First, the students were just three weeks from the end of the third quarter. They were set in their ways and to change it all would have possibly led to student failure because of new and unfamiliar expectations forced onto them. Second, Brian King liked his style, and it suited him. I set out teaching with minor details about my style in mind, but I had not made choices regarding worksheets and handouts or the way to give notes. I was waiting to meet my students. Seeing Mr. King's style, I felt I could make some small adjustments to suit my personality and be as successful as he was. He encouraged this choice because the students would be more receptive to me as their teacher. Finally, Mr. King let me know that if I chose I could supplement his style of lecture only with additional activities and class work but did not push me to try something different. In hindsight, I wish I had made some changes. By the end of my time as a teacher, the students were generally unresponsive to me during lectures or when assigned work. This was not as prevalent in the Biology class because, as 9th graders, they were less rebellious towards authority. In the anatomy classes, the students were older and had more problems with me as an authority figure and, by the end of my time as their teacher, many of the anatomy students were suffering from senioritis. They had been accepted to colleges, and were just wasting time until graduation. They had no desire to be in school any longer and were simply showing up in the mornings to show they were physically in the building, mentally they were not.

3.1 Biology

The following is an example of a typical chapter in my biology class. Each chapter took approximately two weeks to teach and test the student's knowledge. Some chapters extended beyond the two week period due to weather related school cancellations or school assemblies that interrupted first period.

To begin a new chapter, we would dive right in on the first day with the first topic of the chapter. The chapter used here in this example was the second chapter I taught: The Theories of Evolution. Because the content is somewhat controversial, I spent time talking to students about alternative theories stating that some religions, and some leaders of our society, do not believe in evolution but instead believe in other theories. We talked briefly about a few of these theories including creationism. We talked for about half of this first day with the students asking questions and myself answering the questions I could and encouraging the students to look up the answers I did not know. To segue into the chapter, I informed them that we were looking answering the question, *Why and how are we here?*, from an entirely scientific angle, choosing to study this one, widely accepted theory of evolution. I then began lecturing from "the notes", a term uttered in fear by some students in my classes just a few weeks into teaching.

I did not have any teaching experience when I walked into Doherty, and this showed in my lectures for some time. For much of my lecturing, I followed the order of the book. For the information I wanted to teach, the book was laid out in an excellent order. As time moved on, I did follow the book, although not as closely, moving around within the sections of the chapter or teaching one section before another. In order to pick out the points I wanted to convey to the class, I took notes while reading the text book. I did this on white printer paper to give myself more room for notes with diagrams included. I often taught with these notes at the podium or in my hand, one page at a time. For the biology class, I was detailed in my writing on the board, giving the 9^{th} graders a better opportunity to both hear what I was saying and see it in writing, to better facilitate good note taking on their part. Because I would write on the board what was

written in my notes, the student would worry if they saw many pages for a single day. These notes can be found in the appendix.

At the start of the second day, I would take out my notes from the day before and do a quick review of the material covered the day before. I would do this by repeating some information and then spent the rest of the review time asking questions. I would either ask the class or ask individual students questions from the material I had taught them. These questions were often straight from the notes but sometimes would be application questions to get the class to connect to the material on another level. I repeated this process every day.

I lectured to serve three purposes. First, this method gave the class a transition period to get into the lecture. This way they didn't lose any key facts because they were still retrieving their notebooks and pens and getting ready for class. Second, if a main point was missing from their notes they could go back and insert it. Often, students would realize they had missed a major section and would ask me to repeat what I had said. At that moment, I would give them the quick notes from that days review and if they pushed for more I would tell them to ask at the end of class and I would give them more of the information they had missed. As the students got to know me better as their teacher, they would come to me before class if they were confused by the material from the previous day or if they thought they missed something. This class had a unique opportunity available to them as well. Because of DMHS scheduling, a student's first period class was also their homeroom. So students in first period biology had extra time during homeroom to ask questions. Finally, I did the start of the class review as a test for myself. If I had missed a point or explained something poorly the day before it was made obvious to me during this time. With this information I could chose to review a point I had covered the day before in more detail or incorporate it into that days lecture. Each day continued in this same fashion until Day 5.

On Day 5, a quiz was given to evaluate the students on the information covered in the first 4 days of lecture. This quiz was one of three core assessments used during each chapter. The other two core assessments were homework questions assigned with their respective sections and

a test on Day 10. The quiz on Day 5 consisted of 10-15 short answer questions and an additional section that corresponded to the chapter being taught. For Chapter 15, the example chapter for this section, a matching portion was included in the quiz because many scientists had been discussed during the first week. More analysis regarding quizzes can be found in Chapter Five: Assessments.

On Day 6, quizzes were returned and gone over. To hand back graded work, Mr. King announced the students with a perfect score and then proceeded to hand back the remainder of the papers in descending order. The number of As, Bs, Cs, Ds, and Fs for that assignment or assessment were listed on the board at the front of the classroom. Students could count as assignments were handed back and figure out who in the class had which letter grade. Though initially put off by this method, I talked with many of my students and all of them gave me the same explanation. They told me by handing back the work in descending order, they knew who in the class they had done better than and who had done better than they had. This method encouraged them to do well because they wanted to beat their friends or classmates. This was clearly demonstrated in all of my classes when students celebrated moving from a low B to a high B, not only because they were experiencing greater success but also because they had finally beat Simon, a classmate he or she had been trying to beat all quarter. Students were excited to get their papers back to find out their grade and to find out who they were smarter than that week.

In every classroom there are clear academic successes; students who do well no matter the material being covered or the work assigned. Often, these students appear to do no work and still obtain the highest grades. When the average students studies hard before a quiz or test and then gets their paper back before the all-start student, it is encouragement to study and beat her again. If papers were not handed back in this order, they may never how they did compared to their classmates because they are not friends, or because a student chooses to keep his actual number grade to himself. This way, students are able to gage themselves against the students they

believe are the best, without encouraging direct competition by singling out one student for everyone to beat that week. Because only the number of each letter grade is known and not what the actual number grade is, a low scoring student is protected. Though they get their paper last, no student knows it's a 45. To the rest of the class it could be a 64, just one point below the failing line. Finally, the method of listing the number of each letter grade on the board created class to class competition between my Vertebrate Anatomy classes because they could see which of the 4 class periods got the most As, the most Fs, and often the highest average. After handing back the quizzes, I reviewed the answers and answered any questions the students had. If a student had a problem with the grading of an answer they were told to come at the end of class to discuss.

From here we moved into the second week of lectures. Because we had just gone over the quiz, the material from the previous week was still fresh in their heads. I took 5 minutes to hit any additional key topics from the week before that had not been covered on the quiz. This accomplished the second of the three objectives, the "review time" laid out previously in this chapter. This also allowed the student to transition from quiz answer review mode to lecture mode and did it while preventing a loss of new information and allowing the students to add the material if it was missed during notes the previous week. At this point, the lectures continued on days 6, 7, and 8 in the same fashion as days 1, 2, 3, and 4. If needed, lectures continued into day 9. Often the lectures were complete on day 8. Homework that night was to write three questions for the review game we would play on day 9, using their notes from the first 8 days. For the review game, students were broken up into assigned groups and answered questions from their peers. At the end of the class period, the group in the lead would get extra points on the test. The number of points gained from the review game was dependent on the test. Students could obtain no more than an additional 7 points on a test. If I offered bonus point questions the number of bonus points obtained from the review game would be 7 minus the potential value of the bonus

questions. More on the review game and bonus questions can be found in Chapter Five: Assessments.

The final day was fully devoted to the chapter we had been studying; typically on Day 10 a test was given. The tests were constructed to be more involved and to require more time to complete than the quiz. Typically the test comprised of 10-15 short answer questions and two essays. In the case of Chapter 15, described here, the second essay was replaced by a section of 4 questions that required more information than the short answer questions. This was because chapter 15 had one major topic, evolution through natural selection, and then smaller topics to support these. More information regarding this test may be found in Chapter Five: Assessments.

3.2 Vertebrate Anatomy

In the anatomy classes the overall structure was the same with a few changes. These changes were made to adjust both to the material being taught and the maturity and education level of the students being taught.

On the first day, rather than immediately beginning with lecture notes, the students completed study guides. These study guides corresponded with an old text book Mr. King had stored in the classroom. To begin the chapters, students worked on the study guides in pairs using the old text book. This took between two and three days. This was an excellent tool to use for three reasons. First, the students became familiar with the terms. When it came time to lecture the student didn't get as confused by the larger vocabulary and were able to better understand the material in its entirety. Second, the study guides followed the layout of the chapter in the older text book. This followed the material in the text book I was teaching from about 75% of the time. Rather than assigning the reading from the text book I was teaching from and having most of the students ignore reading on their own, the students had to read through the chapter in the older text

book to answer the questions. Finally, the study guides followed the natural flow of the body systems and familiarizes the students with the entire body system, building a foundation of knowledge before I ever began to teach. This way we could go a little deeper into the material at a greater pace because they already had a basic beginning. The study guides took between two and three days. This was dependant upon the number of questions the study guides contained. Once the guides were completed lectures began.

To aid in lecturing the anatomy lessons I used overhead transparencies and a projector. For the first lecture I took the class through an overhead that had the entire system we were studying on it. I gave them the path of the system highlighting each of the parts we would be studying. For example when studying the respiratory system I put up an overhead of the nose, mouth, and lungs displayed in their anatomical locations of the body. I then pointed out the nose, the external nares, the interior of the nose, the pharynx, the larynx, the trachea, the primary bronchi, and the lungs. This was a good way to connect all of the organs and components of the system for the students. It also created a flow to the lectures. To begin the lectures I started with the first organ or component, in the respiratory system, the example used in this chapter, the first topic was the nose. As I neared the end of the class period, I stopped the lecture at the end of one topic if possible. I ended about 5-10 minutes before the end of the period and asked the students to close their notebooks. I picked out one student and asked a question from the material covered that day. I then had that student pick the next student to be asked a question, making sure they had not yet answered a question. This continued until all the students answered a question or until the bell rang.

The next day we did a quick review of the day before as a class. The lectures then continued. When the time came to start the next topic, I would ask the class what part of the system was next. Because we had gone through an overview of the system on the first day, this got the students focused on the system we were studying and worked as a tool to connect all of the lectures together.

The time then came for a quiz. Usually quizzes and tests were on Fridays, however if a long study guide was started on a Monday, lectures didn't begin until Thursday, leaving only one day of material to quiz the students on. So the quiz waited until early the following week. A majority of the study guides were not that long however, so the quiz occurred on the first Friday of the unit. The quiz comprised of 10-15 short answers and a labeling section. The quiz is covered in chapter 5 of this report. The following Monday I handed back the quizzes using the same method for the Biology course previously described in this chapter.

The lectures continued for the second week until all of the material was covered. If we finished on a Wednesday, the class would play the review game. The test would be given on the second Friday, graded, and returned the following week using the same method as with the quizzes. A description of these tests can be found in Chapter 5. Throughout the week the students were working on their homework assignment. The students were assigned all of the review questions at the end of the chapter. The questions were all due during the middle of the second week. At the start of my teaching, the students showed me the paged in their notebooks where they had completed the assignment at the start of a class. After April vacation, I noticed many of the seniors and a large percentage of the juniors were no longer invested in the class. At the time we were studying the digestive system and the students were struggling. I created a worksheet reviewing the entire system and it can be found in the appendix. While the students were completing the worksheet, I had them give me their notebooks to read through their homework answers. I did not grade the answers themselves, but rather how complete the assignment was. Because I did not tell the students ahead of time that I would be collecting the assignment, I was able to gauge how much work they were really doing on their own. I found that many of the students were showing pages of fake answers. A good percentage of the students had answered all of the questions, though many of the answers were short and not fully complete. Though homework did not make up a large percentage of the student's final grade, they did not have many assignments in a quarter so a poor homework grade would have some affect on their final

grade for the quarter. Therefore, by collecting the notebooks and reading the answers I was able to better gauge the amount of work being put into the class and assign a more appropriate grade. This was the final unit I taught in its entirety, but if I had continued to instruct the class, I would have continued with this method of checking the students' work, to make sure they were credited only for the work they completed.

As seen throughout this chapter, I worked to establish a classroom that was fun and informative while tailoring to the needs of as many students as possible, I established additional structure by following nearly the same layout for every chapter, and I taught using one style that had slight modifications made to it throughout this learning process. If given the opportunity to repeat this project, I would use a different style of science teaching that included many more supplements and activities to get the students more involved and more excited.

Chapter Four: Student Dynamics

Fulfilling the requirements of the WPI Teacher Preparation Project included spending 75 hours observing my Teaching Mentor, Brian King, teaching the classes I would be eventually taking over. I then spent 150 hours teaching those classes. Because the majority of my observing was done before I began to teach I had an advantage over my students. During these hours, I not only watched Mr. King and his teaching style. I also watched his interactions with his students, the students' interactions with one another, and their overall relationships with all in the room including myself. As this period progressed I was brought into class discussions. While playing a review game I was often brought in as a second opinion. Mr. King would also ask me to describe material being learned on the WPI campus that was pertinent to the information being taught in the class on that day. Mr. King also took time to share information regarding the students with me. In his classes he had many students with varying circumstances that was, or could, affect their classroom students. Between this information and my personal observations, I had an advanced understanding of the classroom dynamics between the students in each of the classes I would eventually be teaching.

4.1 General Dynamics in Room 316

The classroom was a converted science lab. Along three of the walls were glass fronted cabinets. Inside of these cabinets were dusty beakers, old student projects, and other assorted items. It was clear in the make up of the classroom that Mr. King preferred just to teach with lectures and not using any visuals. The posters that did line the walls to aid in any semblance of scientific discovery were also old and faded and in the same state of disrepair as the articles in the cabinets around the room. Because of a large teaching lab bench at the side of the room, there was no space for a proper teacher's desk. Student desks were old lab benches, with two students at each of the 16 benches. The benches stretched from one end of the classroom to the other. The board at the front of the room stretched as far as the desks just five feet in front of the first row of

benches. This created several problems. There were two problems that caused the most difficulty while teaching within this setup: writing at the extreme left or the extreme right of the board and controlling both ends of the classroom while lecturing.

When writing on the board I could not use either the far left or the far right because the students in the front row at the opposite end of the board could not see what I was writing. In some cases I chose to write at these extremes, but allowed students to move their seats to see more easily. I also made sure to speak slowly and clearly so that the students could focus on, and write, the words I was saying and would not have to rely as heavily on the written text. Also, I made sure to write bigger at the ends of the board.

The second problem got significantly worse as the year proceeded was controlling one end of the class while standing at the opposite side of the classroom. As senioritis became stronger in the Anatomy Classes the students began to talk more freely while I was lecturing. Most often this was a conversation held between the students sharing a bench. If left unchecked the conversation would escalate into a conversation involving the surrounding benches and would rise in volume and disrupt the lecture. I found in most cases I found that if I stood directly next to the bench while lecturing, the conversation would end. Unfortunately these conversations began occurring at opposite ends of the room. If I stood next to the girls in the front row at the left of the room, the conversation began between the two boys at the right of the room and visa versa. The only solution to the problem was to stand next to the bench with the lesser of the two offenders and speak to the students at the opposite ends of the room. I would stop the lecture and say their names and then continue attempting to disrupt the lecture as little as possible. If the talking continued, as it often did after a short hiatus, I would move stand at the center of the room and speak to the disrupting students again saying their names and giving them a look to stop. Finally, if they continued to talk, which happened with a slightly less frequency than did when they had only been spoken to once, I stopped the lecture and asked them to stop talking. One group in sixth period were habitual talkers but were often controlled if I stood next to their bench for a few

minutes. After April vacation, they talked much more and were harder to stop. I stopped them after class and asked them to stop talking during the lectures or I would be forced to move their seats. This seemed to calm them down until my last week.

At that point in the year, the seniors had only three weeks left of school and were clearly not trying any longer. I had a new problem. It wasn't only a few students talking but was instead the entire class I had to control. I used several different techniques that increased in firmness. First I would stop talking and wait for quiet. This worked until I had to stop every 15 seconds and wait for the class. When the talking got to this point, I stopped and asked them to stop talking. This would sometimes be enough, but if the talking had begun early on in the lecture, enough time would lapse after I asked the class to stop talking and the talking would begin again. For a second time, I would use the stop and wait technique. When the talking got to the point of stopping the lecture every fifteen seconds again, I would stop the lecture and stand facing the entire class and tell them to stop talking and would remind them that I could hand out a pop quiz at any time. This was a threat I used only once. Halfway through a particularly chatty lecture I stopped the class and asked them all to put away their notebooks. I had them take out a scrap piece of paper and asked them 10 questions pertaining to the material I spent the previous 20 minutes teaching. At the end of the quiz, I did not collect the papers because a majority of them were mostly blank. This served to drive the point home that I would give pop quizzes and the class settled down for a couple of weeks. Because these students shared other classes with students from the other three periods of Anatomy, word got around that I had started to give a pop quiz and by the end of the second day after the pop quiz, all of the students in my classes knew I was not afraid to give a pop quiz. This served to settle the classes enough until I turned the classes back over to Mr. King.

Another factor that affected the classroom behavior in all of my classes was student absences. Depending on the students that were absent, some lectures went more smoothly, while others became harder. When the students who consistently caused trouble in the classroom were

absent, the lectures proceeded with less interruption and the class learned more material in the standard 50 minute period. However when the top students who always volunteered and answered questions were absent, the class became less responsive as a whole and dragged down the lecture making the 50 minutes period far less productive than the average day. When the student returned to school after an absence, they were expected to turn in any work that was due during their absence and were assigned the work they had missed. This work was due the day after they returned. If students missed a test or quiz, they were expected to complete it within two days of returning. If they were absent the day before the test or quiz and did not have an opportunity to get their notes and books to study, they were granted a one day extension. During my time at DMHS, I found that students would only make up work if they were reminded immediately upon their return to class and told of consequences if they did not turn in the missing work on time. Some consequences used were a deduction of points on late assignments, a more difficult quiz or test, or, in extreme cases, a grade of 0 for the assignment. These were mostly given out only at the end of a quarter because grades had to be given in and I would not assign a random number to an assignment to turn in grades. The students were reminded up to three weeks before the end of term that grades would be due and work needed to be completed. These rules applied to any type of absence with the exception of in house suspensions. Because the students were in school while serving an in house detention, they were given their work at the start of the day to work on and it was due on the day they returned to class.

Much like the situation with in- house suspensions, in which the students were not considered absent from class, students could miss a day of classes to work on a project for another class all day. For example, students in the Drama Classes would go on “Project” during the days they had dress rehearsals for a performance that they were being graded on. The students had to bring around a permission slip of sorts and get approval from all of the teachers that they would not be in class with on the day of their project. This was more common in the upper grades with students working in classes that had a more open approach to teaching. These students on

project were marked as present, though they missed the lecture. If some type of assessment was being given on the day they would be on project I asked them to take the test the next day.

4.2 Period 1 Dynamics

First period was 9th grade honors biology with 26 ninth graders, 2 tenth graders, an eleventh grader, and a twelfth grader. One of the tenth graders failed biology the first year she was enrolled and was repeating the class. The other tenth grader was a transfer student from another school and had not yet taken biology. The eleventh and twelfth graders had begun their careers as DMHS in an alternative science program. Due to funding constraints, in teachers and materials, the program was cancelled and the students were placed in standard science program. All 30 of these students should have shown an aptitude in a previous course that would predict a successful performance in this Biology course. However this was not always the case.

Completing homework assignments on time and in their entirety will lead to good grades in that course. This is a well known fact and anyone who has ever attended school should be aware of this. However there are many factors that play into a student's performance in the classroom as well as their attitude towards school and subsequently to school work.

Students with older siblings or older friends who have a poor regard for school often influence their younger relatives into having the same poor attitude towards school. Even older students can have this influence, telling younger kids homework is "un-cool", or threatening them for being a suck up or brown nose for handing in homework and getting A's. This is an age old battle that is still fought on school grounds everywhere. Do your homework and be a loser, or do not do it and fail but look cool while you spiral down.

Students with support at home often succeed much more than their counterparts without support at home. Usually this is a positive thing; parents or guardians show they value a good education and reward their students with praise for successes in school and likewise punish their students for poor performance in school. If the parents truly show enthusiasm in their student and

over power the negative messages from the older siblings and classmates. This can back fire however, when the parent overestimates their child and fights the school regarding their child's placement in classes. Usually, parents can look at their child's grades and realize they are in the appropriate level of study. But the parents want to shield their child from the poor behaved students in the lower level classes.

Spending any time in a school, an observer would quickly see that the lower level courses are a mixture of students who are academically below average and the students who are troublemakers. The latter spend their days spending as little time as possible learning. When they are in class their cause distractions, interrupt their classmates, and do all that they can to disrupt the learning that could occur if they were not there. Many of these students are intelligent and could be found at the top of their class if they applied themselves. It is these students that parents try to protect their well behaved below average student from by fighting to get their son or daughter into the honors level class, regardless of their past performance or their potential. In my Biology course there were at least six students fitting this scenario, one of these students repeating Biology for the third time. She could not handle the concepts and her parents would not allow her to be moved down to a lower level. She had no desire to work as hard as she would have had to and her grades showed this.

The week before I began observing full time, one of the biology students had been caught with a weapon in his locker. The school administration suspended him and held an expulsion hearing. He was later expelled. Though he was no longer attending the school as of the middle of the third quarter, he remained on the class roster so his attendance had to be recorded and his grade calculated for the rest of the year.

4.3 Period 2 Dynamics

Period two comprised of 14 eleventh graders, 8 twelfth graders and one tenth grader, though the tenth grader stopped attending class by the end of the third quarter. He had arrived late

so many days that he could never make up the time and therefore would never get the credit for the course. He began coming in at the end of the second period everyday, missing Anatomy all together. The remaining 22 students created a very distinct classroom environment as individuals and within the social groups they formed in the classroom.

As a class they often talked back and made it clear they had a problem with my age. As a class they transitioned between topics the slowest and often took the longest to get going at the start of the period. They averaged a high C on most assignments and with final grades. Much of this was because of general laziness and no desire to excel with this material. Among the class several smaller groups arose comprising of 3-6 students. These students stood up for one another and if one member of the group felt I had treated them unfairly I got no response from the whole group until the problem was resolved. Some of the students were not accepted into any of the groups and were on their own within the class. These students didn't cause as much trouble and were among the more successful students in the class, spending more of their time learning the material instead of wrapped up in the drama of the groups that had formed.

Individually, some of the students also stood out, creating situations that had to be dealt with while teaching the material. One of the male students in this class, Jim, had an obvious social disorder. He was an average student, maintaining a B at the honors level. But he was socially awkward. He liked to participate in class, which was great except for his participation often led to him sharing more information than needed. He never shared material that wasn't inappropriate in the ethical sense, though it was often out of place. The students in the class often rolled their eyes when he was called on, knowing that he would probably say something that was irrelevant or more information than any of them wanted. This never stopped me from acknowledging him. I had spent time observing all of the classes before teaching and I had been witness to many of Jim's comments. Because of this, I knew going before the class I would get questions and comments from him and I was better prepared to answer the questions and to apply

his comments to the current material. This was he was able to express himself and feel like a valued member of the class while not taking away from the lecture.

Another student in the class that needed some extra attention was Maria. She needed extra time to take the tests because they contained essay writing and she had a learning disorder that affected her writing. She had a study during first period, so would come get the test at the start of the day and then go sit with a Special Education Teacher in a separate room to begin the test and then would finish during the class time. This way, I was able to adapt to her needs without affecting the entire class. Because she took an active role in addressing her problem, she played a part in being more successful. This served as positive reinforcement for herself.

Another of the girls in the class, Chandra, developed a grudge against me and caused trouble when ever she could. Chandra was very outspoken and was a leader of one of the groups in the class. When she was unhappy about something she made it clear to me and to the class by making snide comments and questioning any decisions I made in class. She was the student that had the biggest problem with my age. Though I never revealed it, she asked every time I returned an assignment or test to her with a low grade. Instead of realizing it was a reflection of the work she did, she chose to blame me making it obvious that she didn't believe someone as young as I was could ever tell her if she knew the material or not. This behavior got worse as time went on and I chose to ignore it, moving on with lectures and continuing with the lecture style that better suited the entire class. In the end, I believe if I had addressed Chandra, it would have only fueled the fire and made lectures more difficult.

A third female student, Kim, stood out for a different reason. She had an identical twin in my period 4 anatomy class, Lily. They were similar in a few ways and different in others. There physical differences and their mannerisms were enough to tell them apart so that if they had tried to switch places, I would have noticed. Though they came from the same home environment, they had never been in the same classroom a situation arranged by their parents. This was an interesting study of Nature vs. Nurture. Clearly the teachers these girls had had in their previous

10+ years of school and the classmates they had worked with affected their attitude towards work and their study skills both within the classroom and at home. In general, Kim had slightly better grades and showed a slightly higher work ethic, while Lily was more outgoing and more willing to answer questions in class. It was interesting teaching them in classes that were back to back. They got the same lecture and had the same work environment at home, but the outcome of their work was slightly different.

Of the four anatomy classes I taught, period 2 was the hardest to control and showed the most dislike towards my teaching style. I tried to make adjustments and tailor lectures to their reactions, but any change I made had no affect so I made small changes to adapt to their general attitude towards me and continued moving on with the material, maintaining my expectations of the class.

4.4 Period 4 Dynamics

Period four was the easiest class to take over. As a whole the students were a lot of fun, getting into the lectures and asking excellent questions, often preempting the following day's lecture. They paid attention and we often were able to move through the material quickly, allowing time for us to go further into related material. For example, when they asked a question that was slightly off topic, we could pause a moment and have a class discussion on the topic and then move back to the material. Because of this, I let myself get to relaxed in my attitude towards the class and once they returned from April Vacation I had a lot of trouble controlling the talking. As the end of the year approached, these students developed the worst case of senioritis. When I asked them individual questions they didn't know the answer and didn't attempt to look up the answer in their notebooks because they had stopped taking notes. The entire left side of the classroom talked constantly, and I began lecturing from that corner as much as possible to get them to stop the talking. This only went so far, and so I spent much of the last unit with them trying to keep the chatter down and get the material out to them. The rest of the class was still

somewhat invested in the material and were able to follow my lectures, even with the constant disruptions of their classmates.

Other than the talking, the students did remain in line and there were not many conflicts between the students and myself. Only one of the male students really stood out as a challenge. Tom was the student that was least invested in the class for the duration of this project. He paid attention in class and didn't cause many disruptions, but on days with quizzes or tests he caused trouble. Every exam we had, he tried to worm his way out. When that didn't work, he sat down and took the test usually doing very poorly, hardly ever passing. On the day of the final quiz I gave, he cut class to avoid taking the quiz. Mr. King had seen him in the halls on the way to class and went and found Tom hiding in the Guidance Counselors office. Mr. King brought Tom back and he was given the quiz. He answered less than 25% of the questions and only labeled a handful of terms on the diagram. It was clear he didn't care about his grade, but he didn't affect the performance of the class, so I only had to make changes in my interactions with him and not with the entire class.

One of the female students, Hannah also posed a problem, but only because of medical reasons. She began experiencing extreme pain in her lower back partway through the year and spent several days bed ridden. She was an average student with a good work ethic and so worked hard to make up any work she missed. I gave her a few extra days to complete assignments because she didn't often missed three to four days at a time. Because she was willing to put in the effort and take a proactive role in completing her work, I tried harder to accommodate her and help her to succeed.

A second female student in the class also stood out. Molly sat in the back of the room with Tom. Though she wasn't the most attentive student in the class she did take notes. Her grades, however, clearly showed she wasn't applying herself out side of note taking. Her parents observed this and contacted Mr. King for a meeting. This was early on in my teaching, so Mr. King took the meeting on his own and then relayed the results back to me. Molly's parents

wanted her to be more attentive to her school work and had chosen that as the reason to schedule the meeting. After the meeting, Molly did try harder and her grades did improve. She mentioned she was being asked everyday at home what she had for an anatomy assignment and was encouraged to get her work done at home and to study. This was an excellent example of a positive home environment. Though Molly's parents were more active than most parents, it would have taken less to get Molly more motivated and to step up in the class.

Except for the bad case of senioritis spreading through the class, and the subsequent excessive talking, period four was by far the easiest to teach. They were most responsive during lecture and had the most fun with the human anatomy.

4.5 Period 5 Dynamics

Period 5 was extremely unique in that it was interrupted by lunch. The school was split into thirds based on location. Each third attended lunch at a different time. The first group would go to lunch for 23 minutes, and then attend a 60 minute class. The second third would attend class for 30 minutes, go to lunch for 23 minutes, and return to class for the last 30 minutes. The final third attended a 60 minute class and then went to the 23 minute class. One third of the way through the year the groups rotated so that the first group had lunch after class, the second group had lunch before class, and the third group had lunch in the middle of class. At the two thirds mark, the lunches switched again. Room 316 was in the third group. When I began observing the school was in the middle rotation, so the students ate lunch half way through class. Two weeks into my teaching, the rotations changed and lunch was before class. This had a significant effect on my teaching. Period 5 was 60 minutes everyday, rather than being 64 minutes long every sixth day. This was a challenge because I couldn't lecture for the entire 60 minutes everyday. If I did, period 5 would get an entire day ahead of the rest of the classes in just two days. I was able to teach a little slower and to do a more thorough review at the end of every lecture, but I still finished early every day. We usually only had about 10 minutes to spare. I found that the students

in the class, familiar with having this period long every day from their previous years at DMHS, were able to keep quiet and talk with each other for a quick break or to get started on work. On days when the talking got too loud, even after asking them to quiet down, I would get up to start lecturing the next day's material and they would immediately quiet down and get to work or have quieter conversations to avoid learning any more material in one day.

As individuals they had the most attitude, but together as a group they were the most apathetic to the material. Each day they sat in class but hardly ever participated and trying to ask questions during lectures hardly ever worked. I would still ask questions, but I wouldn't ask them as frequently as I did in my other classes. The questions would also not be as complex. This was not because they did not understand the material, but because they chose to sit in class and not care about what was going on at the front of the room. I tried different lecturing styles and tried to get the students involved at the front of the room. Nothing changed. Their attitudes stayed the same and their grades were unaffected.

There were a handful of incidents within the period 5 class that needed addressing. First, one student, Mark, used the essay portion of the two tests to let me know he did not like me. The first test he wrote an answer that simply said he would not answer the question. The second time the message was a lot more concerning. Mark wrote "I'm not wasting another minute on your test. I do not respect you but I do have respect for the subject. You are rude and full of yourself." (Appendix, NN). To address this, I first went to Mr. King. He informed me that this was not the first time Mark had acted like this in a class. Teachers do talk to one another and there had been a few incidents in Mark's past. Though on their own each event wasn't troubling collectively it was apparent he was dealing with some issues. A meeting was scheduled with Mr. King, a Guidance Counselor, Mark, and me. The four of us sat down and discussed the incident. The guidance counselor started the meeting reminding Mark that this type of meeting had been held in the past and asked what was going on. Mark informed the three of us meeting with him that he just didn't like my personality or my teaching style, but he had said what he needed to and their wouldn't be

any more incidents in my class. We attempted to inquire further into the incident but Mark insisted that this was the end of his disregard for my teaching. From the day of the meeting on, Mark paid no attention in class. He slept or completed the daily Sudoku puzzle. His grades dropped sharply and he was unresponsive to any attempts made to get him to work in the class. He wasn't disturbing any other students in the class and was not causing any trouble so I finally left him alone with is decision to give up on the class.

Another incident involving a meeting with a student involved half of the back row duo. Chris and Simon sat in the last row of the class never taking notes and very obviously spent the entire class text messaging. During the lecture I would walk towards the back of the classroom and the texting would stop for a few minutes. Chris's parents noticed his grades were slacking and scheduled a meeting. Mr. King, Chris, his mother, his father, and I all met and discussed his performance in my class. Through the meeting his parents discovered that Simon was having a negative effect on Chris. They asked Chris to move his seat and to start taking notes in class. He agreed and began that day, sitting a bench away from Simon and taking notes. His grades quickly rose and his performance in class was obviously improved.

A fourth male student in the class also caused some disturbance. Jared was on project two or three days a week. He was clearly the top student in the class and at first would come in and make up work. As the year moved on, Jared developed senioritis and was less active in making up work. His grades slipped and he showed up to class less and less. I spoke to him and then Mr. King did as well. We both expressed concern with the amount of days he was missing. He didn't understand why we wanted to know and promised to work to get his missed assignments in. This did not affect his absences from class.

Period 5 was a very draining class to lecture to. Because of their general unresponsiveness, I had to work harder to get them to pay attention to the material, even if they refused to take notes. They were generally a quiet group and kept to their own groups within the

class. Their work was usually passed in on time, but showed a lack of effort and was nearly always at the level of good-enough-to-get-by.

4.6 Period 6 Dynamics

Period 6 was interesting because the entire class was only 14 students. These students were hard workers and many of them enjoying the material. A few students would often try to get out of doing work, but in the end would sit down and do what they were asked. Because of the size of the class, the lectures took on a more intimate nature. The lectures were more of a conversation between the students and me instead of me telling them the information.

Two of the students, George and Amelia were almost never present on the day of a quiz or test. George just didn't come to school. Amelia got creative to miss the quizzes and tests. She convinced her parents to dismiss her just before period 6 started so that she didn't miss the entire day, but didn't have to take the quiz or test. She had a study during 7^{th} period so she did not miss anything in the afternoon either. On the day that either George or Amelia returned they were given the quiz or test. This didn't help either of them, as their grades stayed at low Cs.

By the last couple of weeks the senioritis had also affected this small group. They still came to class and were quiet and listened to the lecture, but no notes were taken, questions were not answered as enthusiastically, and their grades became a joke. I tried to get excited for them and encourage them to get back into the material, but they were all content to slide down with their grades and ride out their performance to that point in the year. The few students who did continue at full steam weren't disturbed by the others and the lectures still continued uninterrupted. The students that were ready to be graduated didn't want to be there and I wasn't going to force them to take out their notebooks and stand over their shoulders while they wrote notes, so as long as they did not disturb the other students I allowed them to sit in the class and be mentally absent.

Period 6 was an easy class to lecture to. This was my fourth time through the same lecture on most days, so I had it down pat. The class was mostly attentive and liked to have fun with the material. It always left my day on a positive note.

4.7 Teaching Style in All Classes

Although the dynamics of the classrooms were different there were some common threads in my lectures. I dealt with talking the same way in all of my classes and addressed the various other complications with a similar initial attitude. This allowed me to adapt to each situation more readily. I was able to learn from each experience and use that new knowledge to react to any new situation.

There was also a core structure to my teaching that could be found in all of my classes. I approached the chapters by pulling out enough material for two weeks. A quiz was given halfway through and a test at the end. I did a short review at the beginning of all of my lectures and did a 5-10 minute review at the end of all of the anatomy lectures. More on this core structure can be found throughout Chapter 3 of this report.

To start my time at DMHS I started with a basic lecture structure that adapted to my students over the duration of my time teaching. I made small adjustments every day based on the previous days lecture. Because the core material changed every two weeks, I had to constantly gauge the students' reception of the material, and making changes based on my observations.

The make-up of the students in any classroom affected the teaching style of the course in some way. Whether it is adapting to a behavioral problem, finding a different way to explain a difficult process, or moving the physical layout of the room to better suit the needs of the class, every teacher must adjust. The students are the X factor that most changes a course from year to year and knowing the behaviors and the profiles of the students, better allows the teacher to teach effectively.

Chapter Five: Assessments

Presenting material to students is not sufficient to properly teach a class of students. There must be assessments to gauge the students understanding of the material and to measure their performance within the classroom and at home. This chapter describes the assessments used in my classroom.

5.1 Review Game

The review was played only on the day before a test. Students were split into four groups. The groups were random and assigned by me. Because I assigned them, I made sure to distribute the smartest kids into all of the groups. I did the same with the average and below average students as well, giving no team an advantage over any other. A 1 gallon glass jar with a large mouth was passed around the room and the students put their questions in. On the paper was their name and only the question without the answer. Once all of the questions were in the jar and the students were in their groups, the game began.

A student from the first team came to the front of the room and pulled a question out of the jar. I announced who wrote the question and then asked the question to the student at the front of the room. If the correct answer was given, points were awarded to the group. If an incorrect answer was given, the team lost the points and I asked the question to the student that wrote the question. If they answered correctly their team got the points. If they answered incorrectly, their team got twice the values of the points was taken away.

The review game was a great way to get the students to study. They studied the material at home to write the questions. Then, in class, they were allowed to keep their notebooks open for the first half of the game, allowing them more time to study. At the halfway point, they were allowed to have out blank paper. On this, they could write down the topics that we were reviewing during the game.

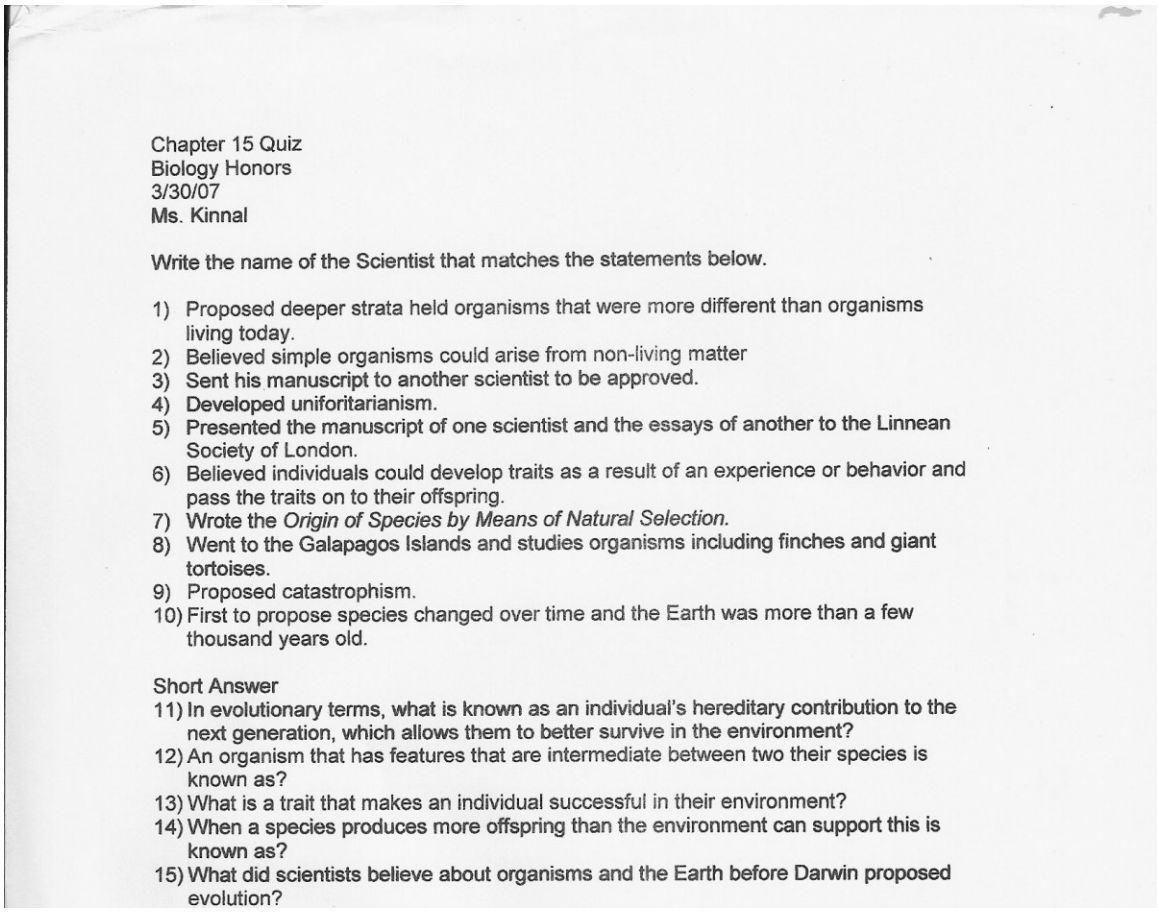
The game gave the students a break from lecture and let them have some fun in class. The students really enjoyed playing the game and at the start of every chapter they asked if we would be playing. The game also allowed the students to get competitive and push one another to learn the material. If a student showed up on game day without studying the material they would let down their team and the team would let him or her know about their disappointment. Finally, it let the students know what material to study because I would comment on the really great questions and make them aware that I might ask the question, or one like it, on the test.

5.2 Biology

The biology students were mostly freshmen in high school and for many of the students, this was the first time they were truly in control of every aspect of their own study habits. Because of this, the quizzes and tests were created using phrases from my notes or from the book. Though it didn't test their application of knowledge as much it did test their ability to pay attention in class, their ability to take notes, and whether or not they were completing their homework. I created the tests to be a better measure of their ability to apply knowledge, while still testing their basic knowledge of the material.

5.2.1 Biology Quiz

The biology quizzes comprised of a number of short answer questions and an additional element. The short answer questions tested the students on material that had been taught up until the day before the quiz. The additional element could take many forms. The quiz seen here had a matching section because the chapter being studied contained several scientists. In other chapters, there was a labeling component to the quiz because that was the element the material warranted.



Chapter 15 Quiz
Biology Honors
3/30/07
Ms. Kinnal

Write the name of the Scientist that matches the statements below.

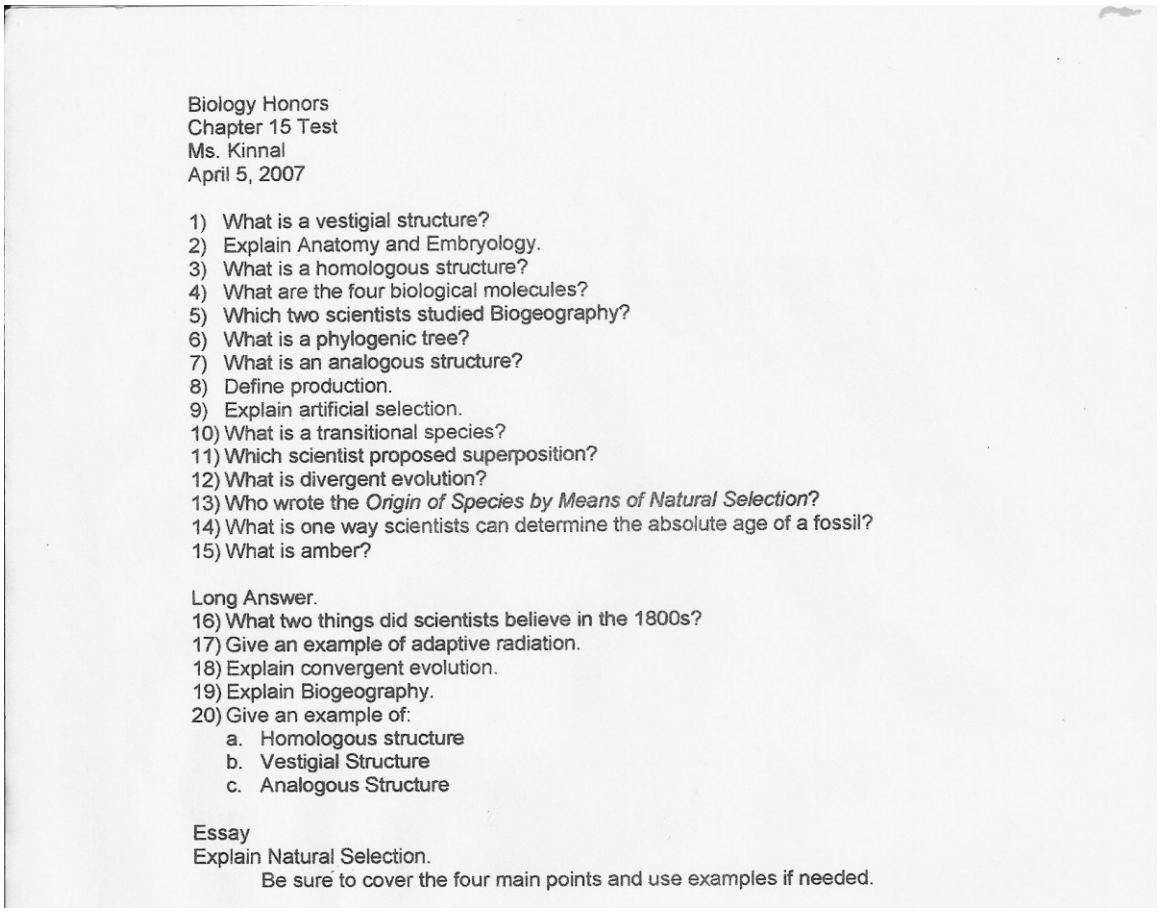
1) Proposed deeper strata held organisms that were more different than organisms living today.
2) Believed simple organisms could arise from non-living matter
3) Sent his manuscript to another scientist to be approved.
4) Developed uniforitarianism.
5) Presented the manuscript of one scientist and the essays of another to the Linnean Society of London.
6) Believed individuals could develop traits as a result of an experience or behavior and pass the traits on to their offspring.
7) Wrote the *Origin of Species by Means of Natural Selection.*
8) Went to the Galapagos Islands and studies organisms including finches and giant tortoises.
9) Proposed catastrophism.
10) First to propose species changed over time and the Earth was more than a few thousand years old.

Short Answer
11) In evolutionary terms, what is known as an individual's hereditary contribution to the next generation, which allows them to better survive in the environment?
12) An organism that has features that are intermediate between two their species is known as?
13) What is a trait that makes an individual successful in their environment?
14) When a species produces more offspring than the environment can support this is known as?
15) What did scientists believe about organisms and the Earth before Darwin proposed evolution?

Figure 1: Chapter 15 Biology Quiz

5.2.2 Biology Test

I used the test to assess the application of the student's knowledge, building on the quiz from the previous week. The test comprised of short answer questions that covered material learned after the quiz was given and usually two essays. In the test below, the second essay was replaced by a number of long answer questions. These were questions that did not require long paragraphs but could not be answered by one or two words. When grading the essays I looked for key words and phrases and whether or not the students had at least a basic knowledge of the system. I only took away all the points corresponding to a given key idea when that part of the answer was completely wrong. Otherwise, I would give some points for at least trying to mention that part of the answer and then write a note pointing out the missed facts.



Biology Honors
Chapter 15 Test
Ms. Kinnal
April 5, 2007

1) What is a vestigial structure?
2) Explain Anatomy and Embryology.
3) What is a homologous structure?
4) What are the four biological molecules?
5) Which two scientists studied Biogeography?
6) What is a phylogenic tree?
7) What is an analogous structure?
8) Define production.
9) Explain artificial selection.
10) What is a transitional species?
11) Which scientist proposed superposition?
12) What is divergent evolution?
13) Who wrote the *Origin of Species by Means of Natural Selection*?
14) What is one way scientists can determine the absolute age of a fossil?
15) What is amber?

Long Answer.
16) What two things did scientists believe in the 1800s?
17) Give an example of adaptive radiation.
18) Explain convergent evolution.
19) Explain Biogeography.
20) Give an example of:
    a. Homologous structure
    b. Vestigial Structure
    c. Analogous Structure

Essay
Explain Natural Selection.
Be sure to cover the four main points and use examples if needed.

Figure 2: Chapter 15 Biology Test

5.1.3 Sudoku Puzzles

The intelligence levels of the students in the biology class varied so greatly that creating a quiz or test to really challenge all of the students was tough. Many of the students finished quickly and would have to sit quietly for 20-25 minutes while the slower test takers finished. One of these faster test takers enjoyed solving Sudoku puzzles and would ask for the puzzle from that day's paper to copy when she had finished her test. When I gave their first chapter test, a second student asked for the puzzle also. And then a third and fourth students came forward, so I wrote the puzzle on the board and nearly every student began to copy it down after handing in their test paper. In the paper that the puzzle was from, the difficulty of the puzzle increased with each day of the week. On Fridays the puzzle had a difficulty level of 4 out of 5, a challenge to all of the

students. Because the puzzle was so difficult, it took a long time to complete and a lot of concentration. This kept the students who had finished their tests quiet, mostly solved the classroom management problem of keeping some students quiet while the others finished the exam. One of the students completed the puzzle and said she wished she could graded on the puzzle solution and not the test answers she had just given because she would score higher. I thought this was a great idea, though it needed a little work. I made a deal with the students in the class. I would reward any student 3 points if they brought me a completed puzzle by the end of period six, the end of my school day. I made this deadline so late to allow the students that worked until the bell the chance to also complete the puzzle. The only condition set was if a teacher in another class caught a student working on the puzzle instead of doing the work for that class, the student would be banned from ever receiving any bonus points, including points won as part of the review game.

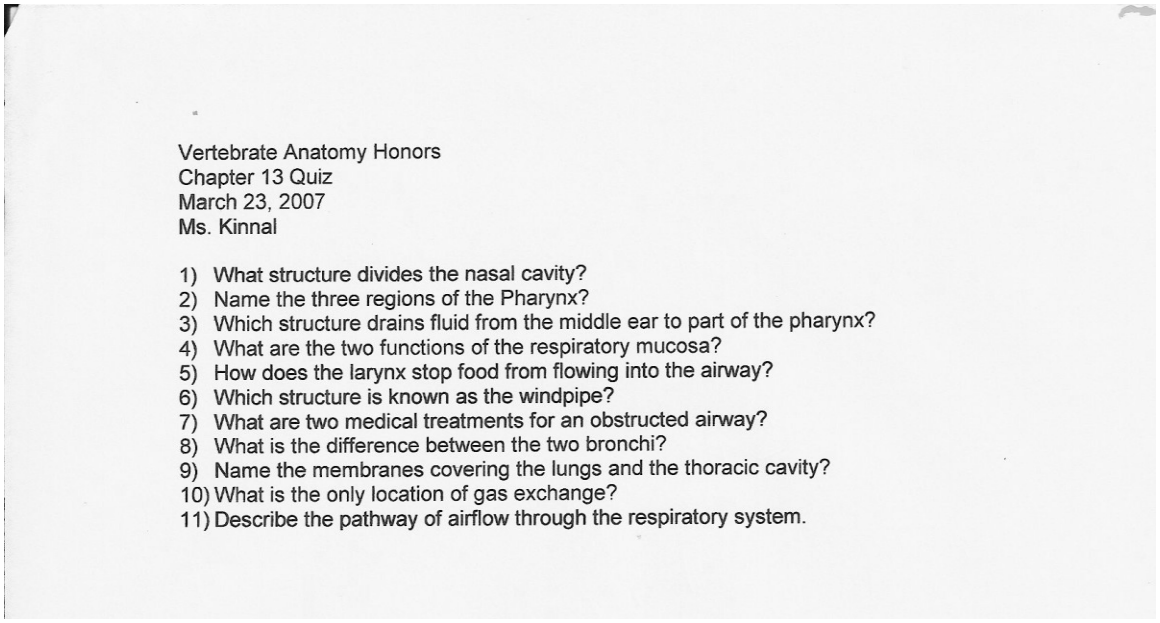
5.3 Anatomy

The anatomy students were expected to memorize the terms of organs and parts of the body and to identify them in a drawing of the body. The quizzes and tests

5.3.1 Vertebrate Anatomy Quiz

Similar to the biology quizzes, the anatomy quizzes tested the students on a smaller portion of material than the tests did. The short answers accompanying the diagram were mostly one to two word answers. These were to test the student's knowledge of the function of the system and the parts of the system. The quiz took between 20 and 45 minutes based on the student profile of the class. Because DMHS only offered anatomy at the honors level, some of the students tested much slower than the others in the class. A number of students would finish the exam quickly and return to their seats to sit quietly. Others would continue to work until the bell rang signaling the end of the period. I was challenged to create assessments that would test both

the quick students and the slow. This problem of some students finishing quickly and others taking longer also presented a problem with classroom management. Though the first few students to finish remained quiet, the noise level began to rise when a little more than half the class had completed the exam. I was able to keep them mostly quiet by reminding the class that some students were still working on the quiz.



Vertebrate Anatomy Honors
Chapter 13 Quiz
March 23, 2007
Ms. Kinnal

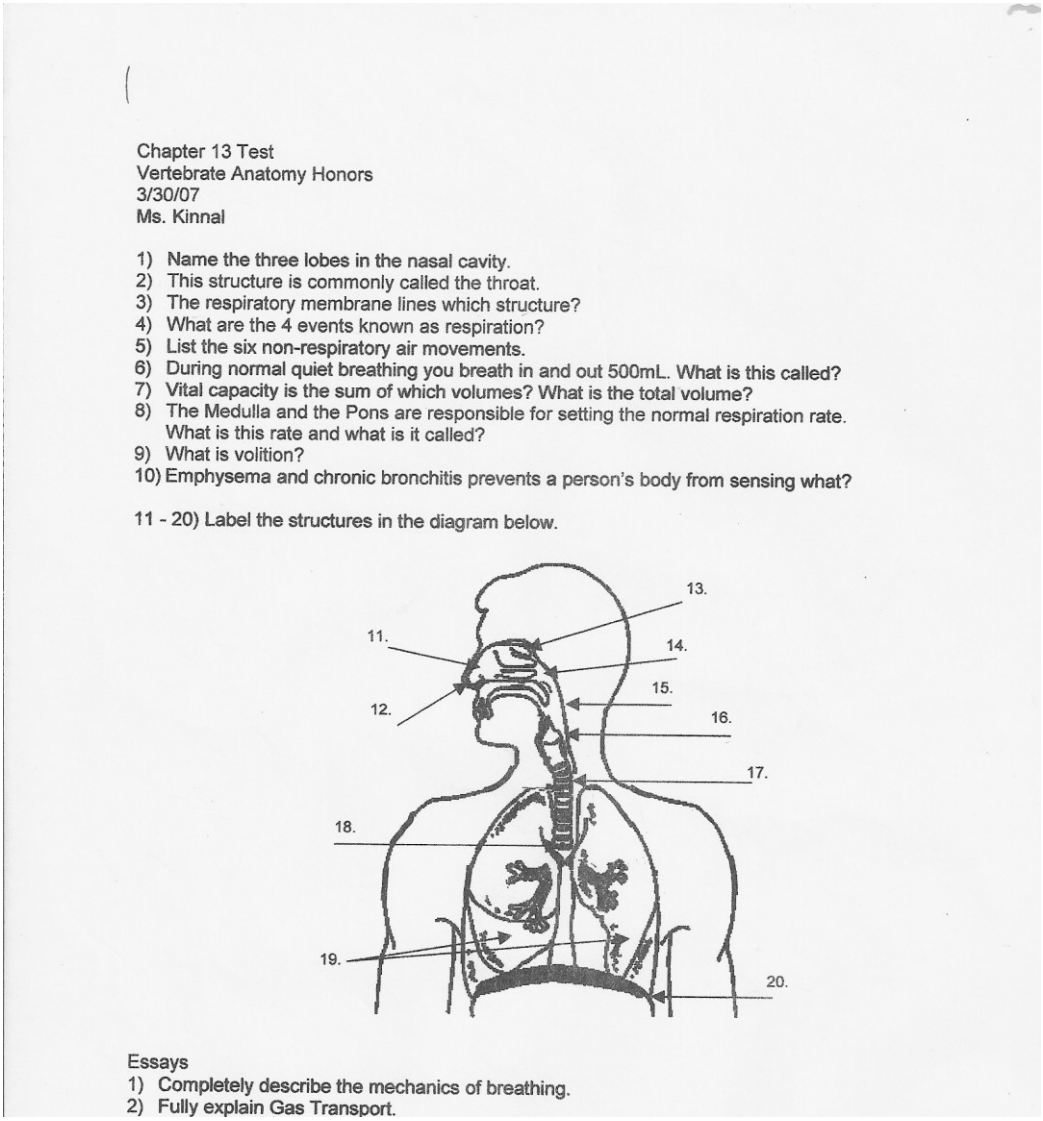
1) What structure divides the nasal cavity?
2) Name the three regions of the Pharynx?
3) Which structure drains fluid from the middle ear to part of the pharynx?
4) What are the two functions of the respiratory mucosa?
5) How does the larynx stop food from flowing into the airway?
6) Which structure is known as the windpipe?
7) What are two medical treatments for an obstructed airway?
8) What is the difference between the two bronchi?
9) Name the membranes covering the lungs and the thoracic cavity?
10) What is the only location of gas exchange?
11) Describe the pathway of airflow through the respiratory system.

Figure 3: Chapter 13 Anatomy Quiz

5.3.2 Vertebrate Anatomy Test

The anatomy tests contained short answer questions, a labeling section, and two essays. The short answers covered only material taught after the quiz had been given. The labeling section and the essays tested the students on information taught throughout the entire unit. The diagram was usually an image of the entire system we were studying. Here you see the respiratory system. This image was not straight from the book, but was instead an image obtained from the internet. I did this for two reasons. First, because the image was already digital it was easier to work with. Second, I didn't want the students to recognize that the pharynx is the orange thing in the diagram but rather that the pharynx is the airway that connects the nasal cavity to the larynx. I felt this would better test the students' knowledge of the system, the look and shape of

the parts within the system, and the locations of those parts. The topics of the essays were usually given to the students the day before, a practice Mr. King suggested I used. The essays were more complex than simply naming the components of the body system and were focused in one specific area. For this test I asked the students about the mechanics of breathing and gas transport. For each of the essays there were key words and phrases I was looking for that were assigned point value. If I found all of the key terms in some form within the essay and was written coherently, the essay was given full points. If a topic was missing or if it was written poorly, the appropriate points were taken away.



Chapter 13 Test
Vertebrate Anatomy Honors
3/30/07
Ms. Kinnal

1) Name the three lobes in the nasal cavity.
2) This structure is commonly called the throat.
3) The respiratory membrane lines which structure?
4) What are the 4 events known as respiration?
5) List the six non-respiratory air movements.
6) During normal quiet breathing you breath in and out 500mL. What is this called?
7) Vital capacity is the sum of which volumes? What is the total volume?
8) The Medulla and the Pons are responsible for setting the normal respiration rate. What is this rate and what is it called?
9) What is volition?
10) Emphysema and chronic bronchitis prevents a person's body from sensing what?

11 - 20) Label the structures in the diagram below.

Essays
1) Completely describe the mechanics of breathing.
2) Fully explain Gas Transport.

Figure 4: Chapter 13 Anatomy Test

5.3 Bonus Questions

Bonus questions on tests and quizzes asked about information that I said aloud in class, but was not in the notes written on the board and not in the main material of the text book. During most lectures, I could add fun facts learned in my classes at WPI. These were the typical material for the bonus questions. Because it was said and not written, the student who attended class every day and paid attention were rewards. Each was worth 1 point and there were only 2 or 3 on each exam. For most of the exams I gave, I wrote the questions on the board during the quiz or test. Then, when the students missed the quiz or test day, they missed their chance at a bonus question. When I made this change to offering the bonus to only students who showed up the day of the exam, I did not make an announcement. I just implemented it when the students came back the following day. This was, the students who were most affected were the students who usually skipped out of the test on the actual day it was given.

Chapter Six: Conclusion

My time at DMHS began in October of 2006 and lasted until May 2007. I spent everyday there starting in mid March. Adjusting to the schedule of starting my day at 5:30 a.m. and ending the school day at 1:15 took some time. Once I settled into this schedule, however, I was met with new challenges.

When I began to teach I had chose to follow Mr. King's style of teaching, a choice I would later regret. I was not suited to teaching lecture only and didn't realize it until the final day when I did a fun demonstration for the whole class and watched as they were all sitting straight up in their seats listening to every word. If I do enter a classroom sometime during my career, it will certainly be full of demonstrations and activities. Classes need to be exposed to many styles of teaching because each student learns differently and every student should be given an equal chance to learn.

The students in my classes were pretty adaptable when it came to switching from Mr. King to me as their teacher. However, because I used a style that didn't really match my personality, they became less and less receptive to me as time went on. Many students saw their grades begin to fall because they were uninterested in listening to me and were not preparing themselves adequately for the exams. Additionally, I was not teaching them as well as I should have. Many of the students saw the poorer grades and chose to blame me, though not entirely my fault. They were willing to let their frustrations show during class and often presented a more challenging and difficult environment to teach in.

I enjoyed teaching the material, though I believe I am better-suited for a different school setting. My high school experience was a 280 girl catholic school in the suburbs of Massachusetts. Though my middle school experience was similar to DMHS, it was still hard to relate to the high school atmosphere my students were in.

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Appendix A: Biology Chapter 13

	Topics	Assignment Due
Monday	Electrophoresis Gel Recombinant DNA	Monday Pg 260 #3-6
Tuesday + Wednesday	Human Genome Project Insights Model Species Application Bioinformatics Proteomics Microarrays	Tues Pg 264 #1-5
Thursday	Quiz	Study
Friday	No school	
Monday + Tuesday	Genetic Engineering Gene Therapy Cloning Vaccines Crops + Agriculture ~~[illegible]~~	Monday: pg 270 #1-5 ~~[illegible]~~ ~~[illegible]~~ Tuesday 272 # ~~8~~, 10-15
Wednesday	Ethics Go Over answers to Review	Pg 272 # ~~9~~, 10-~~15~~ 22, 24 Standardized Test Prep
Thursday	Review Game	Questions
Friday	Test	Study

Chapter 13: DNA Technology

Chromosomes contain all your DNA

only 2% codes for proteins ∴ 98% doesn't
↳ Non-coding DNA

Proteins from 2% of DNA are the same for everyone
ie: eyecolor, hair color, earlobes

Difference between DNA of two people is in the 98%
Non-coding DNA

Length Polymorphisms are variations in length of DNA between genes

Many are ~~repeat~~ short segments GTGTGTGTGTGTGTGTGT CACACACACACACACACA
that repeat -- ~~different for everyone~~
in tandem — ~~Twoper~~ bike built for two.

∴ ~~Their one~~ Variable Number Tandem Repeats (VNTR)

different number of repeats for different people

Repeat one after another

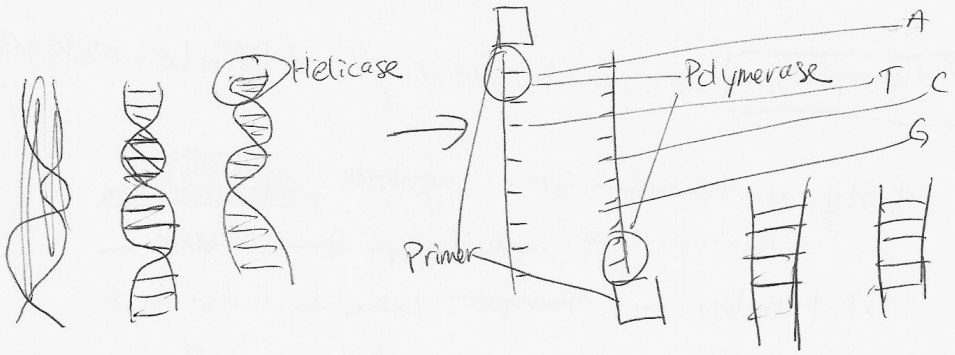
DNA Identification

4 Steps

Copying
Cutting
Sorting
Comparing

Copying

Polymerase Chain Reaction



Simulate – need ingredients

DNA to be copied

~~Primers – trick Pol~~

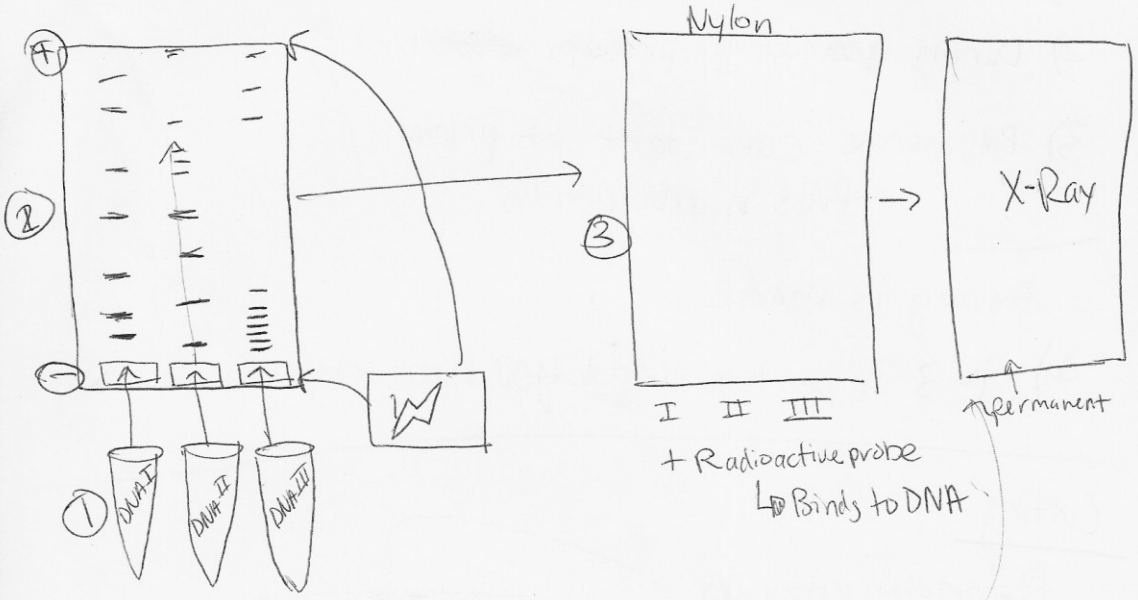
DNA Polymerase

Primers – trick polymerase

Free nucleotides

Sorting — Maury Povich Show

Process - gel electrophoresis



DNA Finger Print

VNTRs - different locations - each like a phone digit

more than one - less of a chance to get same for two people

Crime labs - 13 times 1 in 100 billion ↑ could be for family

1) Add them all together + Heat
DNA unwinds and the two strands separate

2) During cooling - primers bind

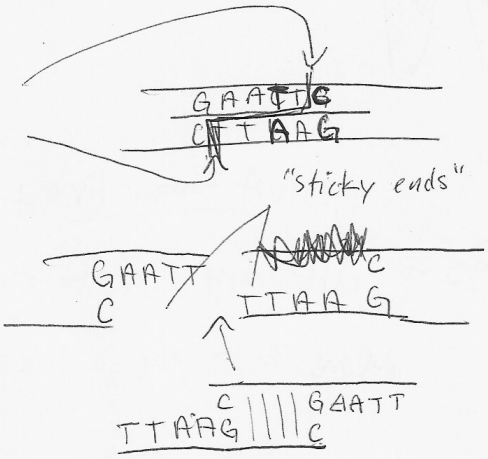
3) Polymerase can start at primer
- fills in nucleotides

A copy is made

4) 1-3 repeated until you have enough

Cutting

Restriction enzymes



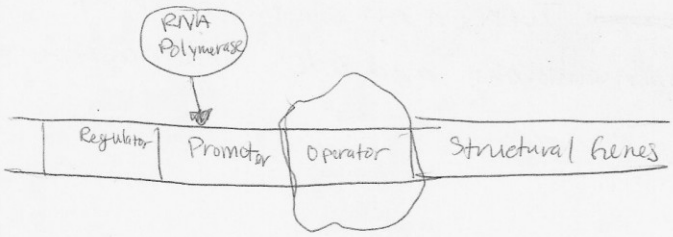
1) Cut DNA

2) Add to gel → Turn on an electric current

3) Transfer to nylon membrane and add radioactive probes

4) Expose X-ray film.

Lac operon



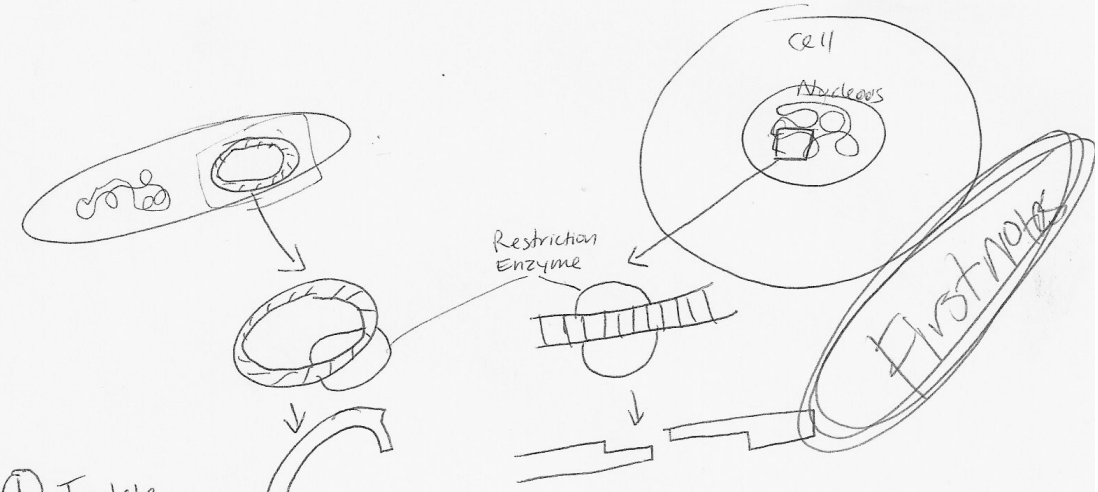
1. Add lactose, Operator leaves — lac operon is on
2. Structural genes make lactase
3. Lactase breaks down lactose
4. When all the lactose leaves the cell the Operator attaches again stoping lactase production

lac Operon is off

~~Even~~ Genetic Engineering

~~the fat~~ cutting - sticky ends - if the DNA is the same couldn't they be put together?

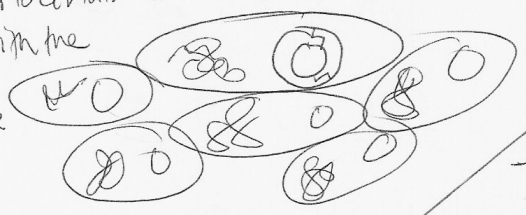
This is Recombinant DNA



1. Isolate Plasmid and DNA
2. Cut with restriction enzyme
3. Combine
4. Plasmids back in bacteria - replicate
5. Probes (radioactive dye) used - attach to certain DNA
   Find the coloring with the right DNA
   Make them replicate

DNA ligase

Plasmid = vector



- makes insulin
- can identify people

Like Cloning - clone isolate DNA

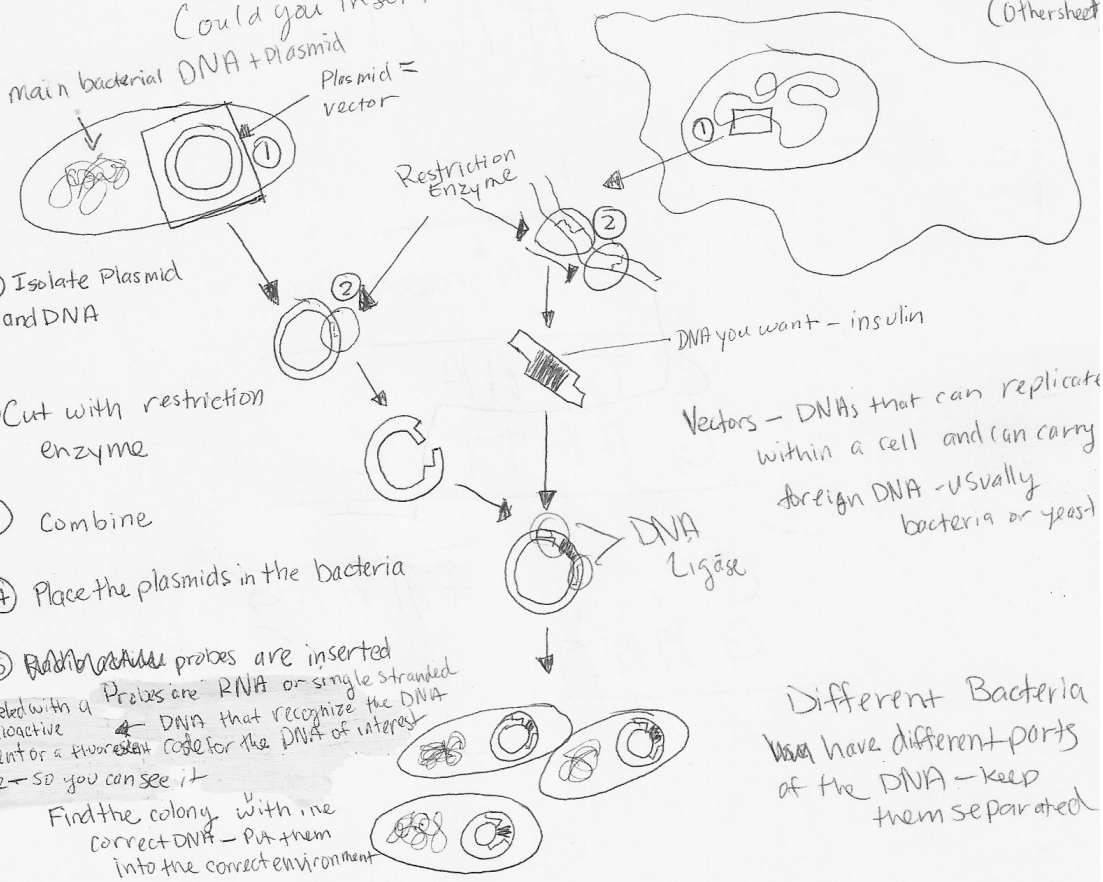
Recombinant DNA

We're going to produce insulin so we need to turn on the gene that codes for insulin. But your cells are broken so you can't make insulin. So what do you do.

Is it possible to remove that piece of DNA that codes for insulin and put it somewhere else

Could you insert it into a similar piece of DNA

lac-Operon- (Other sheet)



① Isolate Plasmid and DNA

② Cut with restriction enzyme

③ Combine

④ Place the plasmids in the bacteria

⑤ Probes are inserted

Probes are RNA or single stranded DNA that recognize the DNA code for the DNA of interest

Labeled with a radioactive element or a fluorescent dye – so you can see it

Find the colony with the correct DNA – Put them into the correct environment

Vectors – DNAs that can replicate within a cell and can carry foreign DNA – usually bacteria or yeast

Different Bacteria have different parts of the DNA – keep them separated

Critical Thinking

Does the DNA structure have to be the same

Why would you cut the DNA from both with the same restriction enzyme

Wrap up

What can you use DNA Technology For?

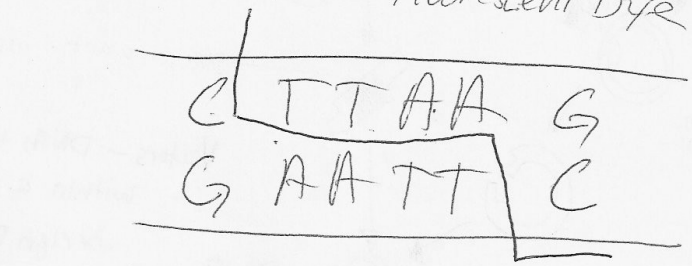
DNA Matching

- Paternity Tests
- Crime Scenes

AATT

TTAA

Fluorescent Dye



C

G AATT

TTAAG

C

HGP - By itself is just a bunch of lines
- If

200 traits and disorders associated with the X-chromosome

US - 1990
UK - early years
Japan - after
France
Germany
China

3 billion base pairs

April 2003

Genetic Tests - muscular dystrophy
- cystic fibrosis
- Huntington's Disease

Pharmacogenomics
→ pharamacology + genetics
→ customized treatments

~~Six countries are our~~

Average gene is 3000 Bases - largest is 2.4 million

Functions of 50% of ~~the~~ discovered genes are unknown

Chromosome 1 - 2968 gene
263 million Base pairs

Y chromosome (231)
59 million base pair

4

99.9% in all humans 30 million base pairs are different

≈ 30,000 genes – more than half – we don't know what they do

~~30 million~~

Understand lineage and migration

Model Species

Scientists have done Genome Project for other Species

Find similar genes - mutate - see what happens

Mouse with an ear

Applications

Found the gene for Cystic Fibrosis - Gene Therapy

By studing genes scientists can find genetic disorders and treat them

Bioinformatics

Using computers research goes faster and is more accurate

Bio informatics - Bio, comp sci, Info tech

- uses databases so scientists can compare gene sequences of model species

Proteomics

Study of all the organisms proteins

2D gel electrophoresis - pulls out proteins better

By electricity the size

Microarrays

Cells - label the mRNA for tumor cells with fluorescent dyes

More mRNA with dye = more binding = more tumor cells

Human Genome Project

Scientists want to map the entire Human Genome
- All DNA

In 1990 scientists from 6 countries in 20 labs
Came together

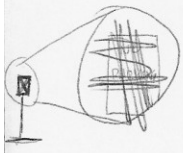
Insights - [what they found]

1) 2% of the genome codes for anything
2) Exons [Remember: what do exons do?] - are unevenly distributed
[They're clumped together]
3) Predicted to be 100,000 genes that code for proteins
Really is between 20,000 and 23,000
RNA doesn't just translate and transcribe it helps
regulate gene expression
4) Exons are spliced in different ways allowing
them to code for many different proteins.
Proteome - all of the proteins in the person
5) Half of the Human Genome is transpons
6) Single Nucleotide Polymorphisms - 8 million
[Spots where people differ]

1) ~~The process that separates DNA by~~

1) Gel Electrophoresis separates DNA by ~~the~~ which two ~~the~~ characteristics

Size
Charge



2) Dr. Dina was working for the crime lab. She ~~left~~ set up a gel but forgot to turn it off before she went to lunch. When she came back there was no DNA on the gel. What happened?

Because the gel was left running all of the DNA had time to cross the gel.

3) What is used to cut DNA to prepare it for Gel Electrophoresis

Restriction Enzyme

4) What charge does DNA have? Negative

OR

~~Does DNA have a charge? If yes is it~~

Steps

1. Isolate → a mature, functioning mammary cell nucleus
   ↳ egg cell - with nucleus removed
2. Fuse the mammary cell with the empty cell and hit with an electric shock
3. Allow the cell to grow and divide into an embryo
4. Embryo was placed in the uterus of a "surrogate mother"

New Sheep

Dolly's DNA is exactly the same as the original donor's DNA

Dolly died after only 6 years, approx. half a sheep's lifespan.
↳ Researchers later found that Dolly had short telomeres

telomeres are DNA sequences that repeate at the ends of chromosomes - shorten with each round of cell division

Short telomeres = premature aging
→ other species don't have the same problem

Successful in goats - DNA was changed so the goat milk has human blood clotting factors

Gene Therapy

Cystic Fibrosis – comes from a lack of the CFTR gene – lack of protein coded by the gene

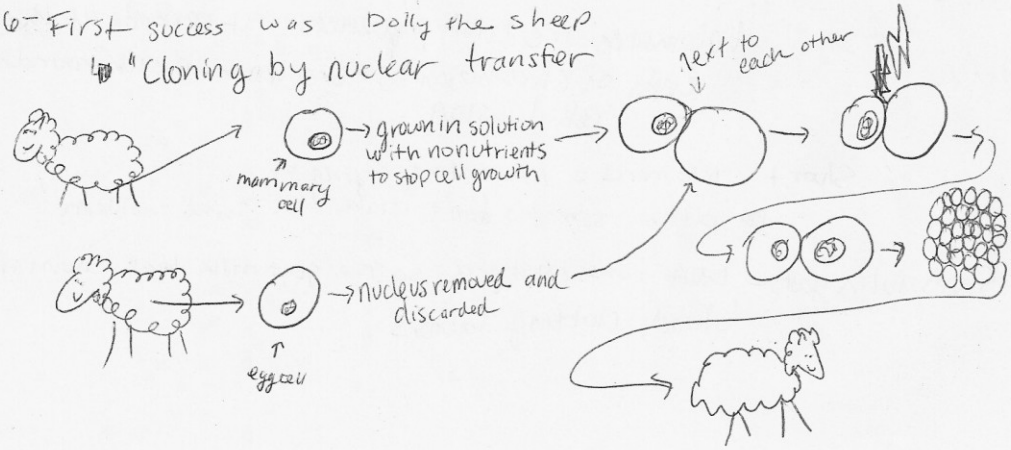
So

1) The CFTR gene is isolated
2) Insert gene into a viral vector
   viruses attack cells ...
3) A nasal spray sprays the virus into the patient – virus infect cells and deliver the CFTR gene which is translated and the desired protein is coded

cloning

1990s – Scientists began cloning whole organism started with sheep and mice

1996 – First success was Dolly the sheep
- "Cloning by nuclear transfer



Add genes to make them resistant to disease

Super plants

Super fish

Super pig – moritorium

Ethics

- Bioethics - study of ethical issues related to DNA
- Genetically mutated crop genes could jump to weeds
  - 1970s standards were set
  - cloning of human embryos - unethical
    - choose eye color, hair color, genetic disease
  - Huntington's Disease - discrimination

Short answer

~~Dolly the cloned sheep died at age prematurely because of shortened chromosomes caused by pieces~~

1) The Human Genome ~~Project~~ has how many base pairs?

2) ~~The largest chro~~ which chromosome is the smallest?

3) What percentage of all human DNA is the same?

4) Which countries contributed to the HGP?

5) In recombinant DNA ~~[illegible]~~ what enzyme joins the vector and the DNA of interest?

6) Why do you cut the ~~pieces of~~ the plasmid and the DNA of interest with the same restriction enzyme?

7) What is the name of the procedure that was used to clone the first sheep?

8) What does SNP stand for in the ~~[illegible]~~ Human Genome Project?

9) What causes the mammary cell to pause in growth?

10) Poly plody

11) Inbreeding

12) Hybridization

13) What part of Dolly's chromosomes caused her lifespan to be only 6 years

(4) What process separates DNA by size and charge?

15) What is bioethics?

Extra

1) what was genetically added to goat's milk

2) which kind of animal was prevented from being made super?

Essays

1) Explain the steps of cloning by nuclear transfer.

2) List the 6 insights of the HGP.

Appendix B: Biology Chapter 15

Chapter 15 – Theory of Evolution

Evolution – The development of new types of organisms from preexisting types of organisms over time

Most widely accepted Theory of Evolution was that of Charles Darwin (1809–1882)

Before Darwin there were several ideas.

In Europe during the 19th century scientists believed that
1) all species were permanent and never changed
2) the Earth was only thousands of years old – not billions

Slowly scientists started to explore the possibly of species changing over time and the Earth was older

Geology

Late 1800s – scientists were studying rock layers "strata"

Each new strata formed from rock deposits

Lowest = oldest

Highest = youngest

Scientists also found different fossils in different strata.

Georges Cuvier (1769–1832) – French anatomist

Reconstructed bones of organisms.

① Found some organisms were unlike any other species known on Earth so he proposed they had become extinct.

extinction – organisms ceased to exist after a catastrophic

(2) Cuvier found that deeper Strata had organisms (2)
that were increasingly different

(3) Finally - Found "sudden" changes in the kinds of organisms in one stratum compared to the next

To explain the observations Cuvier came up with the idea of catastrophism

Catastrophism - idea that sudden geologic catastrophies caused the extinction of large groups of organisms at certain points in the past

Scientists no longer believe in catastrophism but Cuvier opened the possibility and acceptance that geologic change and

Charles Lyell

Shared some of Cuvier ideas but not all
Believed that processes that had occurred continued in the present.

His idea was Uniformitarianism
Darwin read Lyell's studies and found many similarities in their ideas. Darwin referred to

Lamark

(3)

Jean Baptiste Lamarck (1744-1829)

Also supported the idea that species changed over time

But proposed an alternate idea

1. Simple organisms could arise from nonliving matter
2. Simple forms of life inevitably develop into more complex forms
3. Life forms could also develop traits as a result of an experience or behavior and could pass the traits to offspring — known as inheritance of acquired characteristics

Lamark's ideas were accepted on a small scale but were eventually rejected

Darwin (4)

In December of 1831 The HMS Beagle sailed to South America to chart lesser known areas while the crew were doing this, Darwin spent much of his time on the shore collecting specimens.

He began to notice different locations had different species adapted to fit the location they were in. Flora and Fauna adapted from the Brazilian Jungles to the desolate islands near antarchtica to the grasslands of Argentina to the Andes Mountains.

- Galápagos islands on the equator about 900km west of South America.
  - Found species here like no others on Earth
  - Most interestingly were the finches - 13 of them.
    - Some finches were only on one island while others were on many islands.
    - Each had many similarities with a few differences

Darwin went Back to the UK and began working on theories

Eventually he put together an essay and was urged to publish before someone else did.

Sure enough Alfred Russell Wallace soon sent a manuscript to Darwin outlining natural selection.

Darwin sent these to Lyell and both Wallace and →

Darwin's work were presented to the Linnean Society of London.

In 1859 Darwin published "the Origin of Species by means of Natural Selection"

Although Wallace was first, Darwin had more to back his ideas and journals show Darwin had developed Nat. Selection 15 years before reading Wallace's work.

In his book Darwin used the word evolution only once, in the final paragraph. throughout the book he referred to evolution as descent with modification

All species living or extinct descended by reproduction from preexisting species must be able to change over time

(He wasn't the first - Cuvier)

He was the first to propose that all life came from one or a few original life forms

Natural Selection - the mechanism of descent with modification

6

4 main parts

① Over production - Each species reproduces more offspring than the environment can support so the competition is greater

1. Food
2. Predators
3. Disease

② Genetic Variation - traits like long legs or thick fur occur in a species and can be passed to offspring

③ Struggle to Survive - each individual in a species must compete with all the other individuals in a "struggle for existance"

Think fur in colder climates

Thin fur dies — Thick fur is passed on in generations

Adaptation - a trait that makes an individual successful in its environment

④ Differential Reproduction

Organisms with the best adaptations are more likely to survive so they will reproduce

Through inheritance, adaptations will become more frequent

So populations may become adapted to different environments but started from same ancestor

CORE IDEA.

Survival of the fittest - to describe natural selection (7)

fitness - in evolutionary terms is an individuals
· hereditary contribution to the next generation

adaptation . can be long term - hereditary
short term
- acclimatization.

Fossil Record

fossil - the remains or traces of an organism that died years ago

Nicolaus Steno - (1638-1686) - 1669 proposed superposition
- lowest strata is oldest

Geologists in 1700s and 1800s built on Steno's ideas
Began to compare strata and assembled a timeline

Geologic time scale

Geologists can figure the relative age of a fossil
relative age is the age of a fossil compared to other fossils

Sometimes can find absolute age of the rock of the strata
technique radiometric dating

fossil doesn't always form

B

Chapter 15 Quiz
Biology Honors
3/30/07
Ms. Kinnal

Write the name of the Scientist that matches the statements below.

1) Proposed deeper strata held organisms that were more different than organisms living today.
2) Believed simple organisms could arise from non-living matter
3) Sent his manuscript to another scientist to be approved.
4) Developed uniformitarianism.
5) Presented the manuscript of one scientist and the essays of another to the Linnean Society of London.
6) Believed individuals could develop traits as a result of an experience or behavior and pass the traits on to their offspring.
7) Wrote the *Origin of Species by Means of Natural Selection.*
8) Went to the Galapagos Islands and studies organisms including finches and giant tortoises.
9) Proposed catastrophism.
10) First to propose species changed over time and the Earth was more than a few thousand years old.

Short Answer

11) In evolutionary terms, what is known as an individual's hereditary contribution to the next generation, which allows them to better survive in the environment?
12) An organism that has features that are intermediate between two their species is known as?
13) What is a trait that makes an individual successful in their environment?
14) When a species produces more offspring than the environment can support this is known as?
15) What did scientists believe about organisms and the Earth before Darwin proposed evolution?

Bio Quiz Chapter 15 Answer Key B

1. Cuvier
2. Lamark
3. Wallace
4. Lyell
5. Lyell
6. Lamark
7. Darwin
8. Darwin
9. Cuvier
10. Cuvier

11. Fitness
12. transitional Species
13. Adaptation
14. Overproduction
15. Earth was only a few thousand years old
    Organisms never change

Fossil record inferences

1. Different organisms lived at different times
2. Today's organisms are different than those of the past
3. Fossils in adjacent levels are similar
4. By comparing fossils we can figure where and when organisms lived

Transitional Species

Organisms have changed gradually

Transitional species have features that are intermediate between two other species

Pakicetus – Ambulocetus – Dorudon – Whales

50 million 49 million 40 million Present

Biogeography

study of the locations of organisms around the world.

– Darwin + Wallace → observed animals that had similarities but had different adaptations based on environment

Australia – mice, moles, wolves, cats, and anteaters

~~these~~ most, though, are marsupials

– possible explanation – evolution isolated to Australia.

Anatomy + Embryology

Descent with Modification also explains the findings of

1. Anatomy - the study of the body structures of organisms
2. Embryology - the study of how organisms develop

Human, Penguin, Alligator, bat → all have similar bone structures

all have similar bone structure

Idea is - they all shared the same ancestor and eventually evolved depending on their needs.

Homologous Structures - anatomical structures that occur in different species and that originated by heredity from a structure in the most recent common ancestor of the two species.

Related structures even if different functions

Analogous structures - closely related functions but not from the same ancestral function

birds, bats, moths - all have wings

different underlying structures

Vestigial structures – serve no function but in a (10)
resembles structures in other organisms that serve a purpose

human coccyx

Animal Embryos – early stages are similar

theory is vertebrates have a common ancestor

Biological Molecules

DNA, RNA, proteins, and other biological molecules

Developing Theory

Mid 1900s did ~~study~~ with natural selection ~~key~~ become integrated ~~with~~ understanding genetics

This is called modern synthesis

phylogeny – Relationships by ancestry among groups of organisms

Analyze much evidence – sometimes evidence supports two different models

phylogenetic tree

"Trunk" common ancestor, more similar, closer together

shorter – extinct

Evolution in Action

convergent evolution – different species evolve similar traits

Example - scientists studied anole lizard species on three islands of Cuba, Hispaniola, Jamaica and Puerto Rico
noticed that each island had different adaptations to adjust to environment
but also had a similar twig-dwelling species

2 hypothesis
① common ancestor

② different ancestor – some adaptation

DNA supports #2

Divergent evolution - a process in which the descendants of a single ancestor diversify into species that each fit different parts of the environment

Adaptive Radiation
– a species is suddenly in one area and adapt to fill out the area

lizards
① Log from hurricane ② Differences ③ unfavorable die ④ Population is several groups

Artificial Selection – a human breeder chooses individuals (le) that will parent the next generation

All dogs originated from a common ancestor
- similar DNA to a wolf in Egypt
→ proof that man domesticated the wolf 15,000 years ago

Coevolution – two or more species have evolved adaptations to each other's influence

flowers become poisonous
- animals adapt
prey runs faster, predator faster

Tennessee vs. John Scopes - 24 yrs old
The "Monkey Trial"

Summer 1925 – bio teacher charged with illegally teaching the theory of evolution

William Jennings Bryan – tried to banish Darwin

Darrow was the defense

Biology Honors
Chapter 15 Test
Ms. Kinnal
April 5, 2007

1) What is a vestigial structure?
2) Explain Anatomy and Embryology.
3) What is a homologous structure?
4) What are the four biological molecules?
5) Which two scientists studied Biogeography?
6) What is a phylogenic tree?
7) What is an analogous structure?
8) Define production.
9) Explain artificial selection.
10) What is a transitional species?
11) Which scientist proposed superposition?
12) What is divergent evolution?
13) Who wrote the *Origin of Species by Means of Natural Selection*?
14) What is one way scientists can determine the absolute age of a fossil?
15) What is amber?

Long Answer.
16) What two things did scientists believe in the 1800s?
17) Give an example of adaptive radiation.
18) Explain convergent evolution.
19) Explain Biogeography.
20) Give an example of:
    a. Homologous structure
    b. Vestigial Structure
    c. Analogous Structure

Essay
Explain Natural Selection.
Be sure to cover the four main points and use examples if needed.

1) Serve no function in one organism but resemble a functioning structure in another

2) Anatomy - Study of the body/structure of organisms
Embryology - Study of how organisms develop

3) Structure similar in many organisms

4) DNA, RNA, Protein, other

5) Darwin and Wallace

6) Tool used to study phylogeny - how organisms are related

7) Closely related species but no common ancestor

8) ~~Reproduction~~ One species produces more offspring than the environment can handle

9) Humans pick the parents of newest generation

10) A species that has characteristics of two other species

11) Sperm

12) Organisms evolve away from one another

13) Darwin

14) Radio carbon dating

15) Petrified sap

16) Earth = 100s organisms static

17) Anole Lizards on New Guinea

18) ~~Two organisms evolve together~~ Two organisms - different ancestor usually see changes and then the same

19) The study of where organisms are in the world

20) a) Arm in bat, penguin, alligator, human
b) Tailbone
c) Wings

1) overproduction

2) Genetic variation

3) Struggle to survive

4) Differential Reproduction

Appendix C: Biology Chapter 17

Chapter 17

1

Classification of Organisms

Classified and named 2 million species - so many more to go

Biodiversity - the variety of organisms considered at all levels from populations to ecosystems

(1)

Insects are #1 in new species per year

Many systems over the years - problems with each

Genus

Manis ~~pentadactyla~~ ~~per scientist~~

~~temminckii~~ pangolin

Taxonomy - describing, naming, and classifying organisms

(2) ↳ creates a system - **levels** in the system are taxa (taxon)

First system - Plant or Animal

differences in stems — land, air, water

Used common names ~~[illegible]~~

- different everywhere

(5) ex: torch - firefly here, flashlight in London

2

African Elephant

Genus- loxodonta

Species africana

Dog Genus Canis

Species C. lupus

Subspecies –

Kangaroo Genus Macropus

Species rufus
gigateus
fuliginosus
antilopinus

Linnaen

with 6

Linnaean System

Carolus Linnaeus developed a system in the 1700s
- animals are grouped into hierarchical categories

3

8 tiers

Domain
Kingdom
Phylum
Class
Order
Family
Genus
species

Pale
Keeps
Perfect
Control

over
Five
Generations of
Sons

3

Originally Linaeus only had two kingdoms
↙ animals ↘ Plants

4 Modern scientists have added more kingdoms as well as Domains

6 Binomial Nomenclature

Gets away from problem of common names

latin name with two parts

1st = Genus

2nd = species identifier > examples

Genus capitalized - all in italics

sometimes subspecies - dogs

subspecies = variations of a species that live in different geographic areas

0

1

Originally Linnaeus grouped organisms by visible Charateristics - scientists now look at biological molecules too

New way - systematics - group organisms by all similarities → physical + chemical

phylogenetics - comparison of the relationships among taxa - evolutionary / ancestral

phylogenetic tree

ie embryo development

Fossil record is good - but what about organisms with no bones - worms, fungi, bacteria

Systematics also find the difference between homologus structures and analogus structures

Cladistics — Willi Hennig ②

shared characters

↓

all members of a group have the characteristic

(hair in mammals)

(feather on birds)

Most common

derived characters

↓

character evolved only in the group being studied

feathers in birds

least common

If organisms share derived characteristics scientists believe they had a common ancestor

clade = organisms + all descendants

↳ to show — create cladograms

Cladogram Example 1

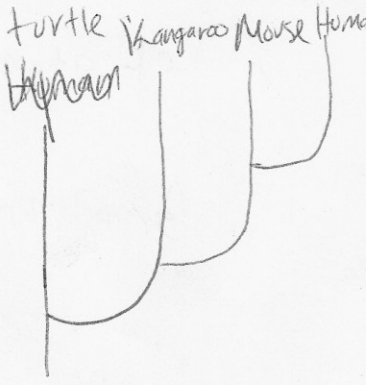
Turtle — backbone, paired appendages, nerve cord, aorta, amniotic egg

Kangaroo — hair, warm blood, egg inside

Mouse — placental development

Human — large brain

	warm blood	placental development	large brain
Turtle	0	0	0
Kangaroo	1	0	0
Mouse	1	1	0
Human	1	1	1



1st 3

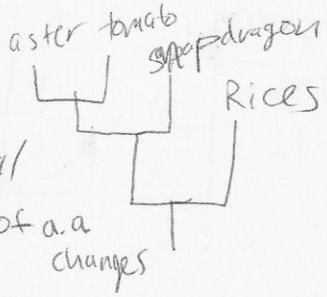
example of linnaen

Animalia
Chordata
mammalia
Primates
Hominidae – humans, chimpanzees, gorillas, orangutans
Homo
sapiens 12 extinct
Sapiens

---

molecular cladistics

look at amino acids



Branch length proportional to # of a.a changes

longest = most

shortest = least

Chromosomes– compare

All together – systematics look at

1. Physical features
2. embryos
3. Genes in nucleus
4. Mitochondrial DNA
5. Ribosomal RNA

The Tree of Life

Revising the tree

Originally two groups - eukaryotes..
prokaryotes..

But some organisms can fit somewhere else

Originally looked at homologus structures

Not all organisms in one or the other based on physical attributes.

so scientists look at molecular structure

↳ Based on this - Carl Woese

1977 proposed major revision

created 6 kingdoms.

looked at rRNA - all organisms have rRNA

rRNA hasn't changed overtime

Insights about relationships between major groups

① Data are consistent with theory that all RNA in cell organisms came from the same ancestoral organism

② 3 Major domains
Bacteria, Archaea, Eukarya

③ In terms of Archaea — most recent
Thought Archaea were Bacteria but found differences.
Archaea descended from ancient prokaryotes

Synapomorphies

Bacteria
- Small, single-celled prokaryotic organisms
- usually have a cell wall
- reproduce by cellular fission

- cell wall, plasma membrane, cytoplasm free of organelles, at least one circular chrom

Archaea
- Prokaryotes
- Distinctive cell membranes
- some produce food by chemosynthesis
- Some produce flammable gases - often live in harsh environments

Biology Honors
Classification Quiz
Ms. Kinnal
4/27/07

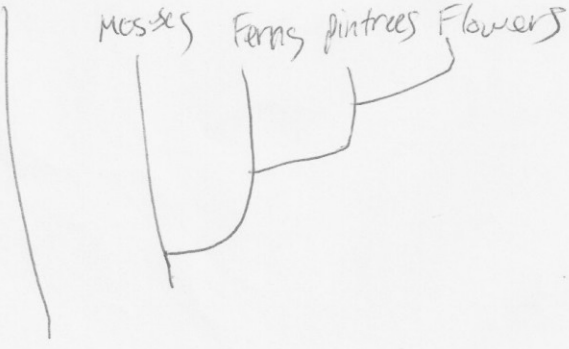
1) Aristotle developed the first classification system and organized organisms into which two categories?
2) What was the problem with using common names when classifying organisms?
3) What is the name of the modern classification system that scientists still use?
4) Originally scientists looked only at physical characteristics. What do they also use now?
5) Why isn't the fossil record good to use to classify all organisms?
6) What is the name of the system that uses shared characters and derived characters to classify organism?
7) Define shared character.
8) Give an example of a derived character.
9) What is used to show an ancestral organism and all of it's descendants?
10) Molecular cladistics looks at what molecule in organisms?
11) Define systematics.
12) What is the process of naming an organism with two Latin names?
13) An organism is given two names. What is the first name and what is the second name?
14) What is a subspecies?
15) Which animals are humans most like?

Long Answer
16) Name the 8 tiers of classification in the modern system.
17) Below is a chart showing the relationship between 4 organisms and 3 traits. Please draw the cladogram.

	Characters		
Organism	Vascular Tissue	Seeds	Flowers
Mosses	0	0	0
Ferns	1	0	0
Pine Trees	1	1	0
Flowering Plants	1	1	1

1. Plants and animals
2. Confusing. Meant different things in different languages
3. Linnaean
4. Chemical / Bio molecules
5. Soft Bodied organisms
6. Cladistics
7. Many groups have it
8. Feathers on birds
9. Cladogram
10. amino acids
11. Using physical, chemical, embryo
12. Binomial Nomenclature
13. Genus / species Identifier
14. One species in various geographic locations
15. Primates
16. Domain
    Kingdom
    Phylum
    Class
    Order
    Family
    Genus
    species

A B C D F
9 5 6 & 4



Essays

1)

Inspiration - Diaphragm + External Intercostals
Expiration
Thoracic Expands
Lungs expand because of pl/vera
Volume Change
Pressure Change
Air moves in
Passive - Muscle relax
Active - Abdominal Muscles and Internal Intercostals help
Air moves out

2) O_2 dissolves
O_2 attaches to hemoglobin
oxyhemoglobin HbO_2
CO_2 attaches to Hemoglobin
CO_2 grabs water
Becomes carbonic acid
Drops a H^+
Becomes bicarbonate
Travels to lungs
Grabs a H^+

Becomes carbonic acid
Breaks down to $CO_2 + H_2O$
CO_2 Out
H_2O in blood

Appendix D: MCAS Essay Answer Preparation

Open Response

1) The chart below shows some triplets from a DNA sequence (codons) and their corresponding amino acids.

DNA Codon	Amino Acid
AGA	Arginine
AGG	Arginine
AGC	Serine
AGT	Serine
GGA	Glycine
GGT	Glycine
GGC	Glycine
GGG	Glycine
TTG	Leucine
TGG	Tryptophan
TCG	Serine
TCT	Serine

A sequence of DNA in a gene reads GGT TCG AGA.

a. What is the sequence of amino acids that is produced when this gene is translated?

b. If the DNA is mutated to read GGT TGG AGC, what will the sequence of amino acids be?

c. Rewrite the original DNA sequence with a single mutation that would **not** change the sequence of amino acids.

d. Explain how a mutation can change the DNA but not change the amino acid sequence.

2) The wrasse and the blenny are two small fishes that resemble each other. The wrasse eats parasites attached to the skin of other fish. Even some large predatory fish allow the wrasse to approach unharmed and eat parasites. Predatory fish also allow the blenny to approach. However, instead of eating parasites, the blenny attacks the predatory fish.

a. Is there evolutionary pressure for the blenny to look like the wrasse? Explain what causes the presence or absence of this evolutionary pressure. Be sure to use specific details in your answer.

b. Is there evolutionary pressure for the wrasse to look like the blenny? Explain what causes the presence or absence of this evolutionary pressure. Be sure to use specific details in your answer.

3) A Punnett square is a tool used to predict the outcome of a genetic cross.

a. Make a Punnett square for the cross of a father heterozygous for short fingers and a mother homozygous dominant for short fingers. Use **B** to indicate the allele for short fingers and **b** to indicate the allele for long fingers.

b. Identify the expected percentages of the phenotypes in the F_1 generation for the cross in part a.

c. Make a Punnett square for the cross of a tall father who is homozygous dominant for height and a short mother who is homozygous recessive for height. Use **T** to indicate the allele for tall and **t** to indicate the allele for short.

d. Identify the expected percentages of the phenotypes in the F_1 generation for the cross in part c.

Open Response Question Ms. Kinnal 4/15/07

1) The chart below shows some triplets from a DNA sequence (codons) and their corresponding amino acids.

DNA Codon	Amino Acid
AGA	Arginine
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GGA	Glycine
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GGG	Glycine
TTG	Leucine
TGG	Tryptophan
TCG	Serine
TCT	Serine

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Appendix E: Anatomy: Respiratory System

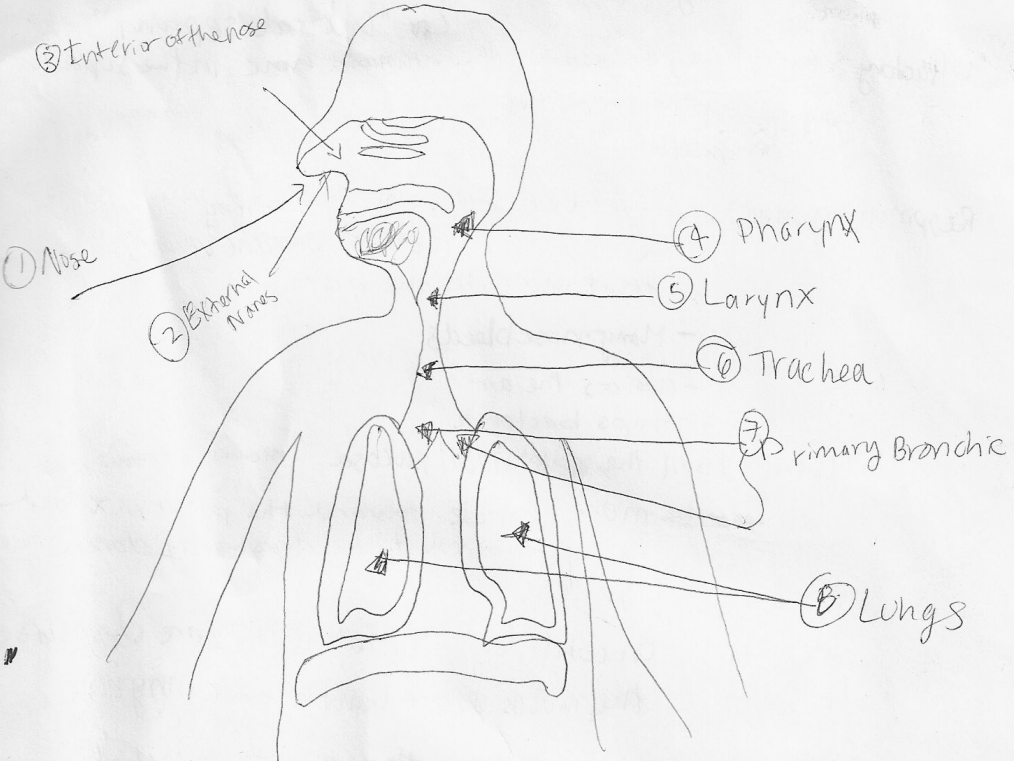
		Topic	HW Due
15	Thursday	Study Guide	
16	Friday	Non School	
19	Monday	Study Guide	
20	Tuesday	Study Guide	#1-5
21	Wednesday	Func. Anat. – Nose, pharynx, larynx, trachea (F 13.1)	#6-10
22	Thursday	Trachea, Primary bronchi, lungs (13.2 ??) (13.4 B)	#11-15
23	Friday	Quiz – Respiratory membrane (13.5) (13.6)	Study
26	Monday	Physiology – Inhale + Exhale Volume + Capacity (13.7 ??) (13.9)	#16-20
27	~~Tuesday~~ (13.10) (B.A B)	Resp sounds – External Resp Gas Transport, Internal Resp	At the Clinic 1-3
28	Wednesday	Control and regulation (13.12) Disorders Developmental	Study
29	Thursday	Review Game	Review Questions
30	Friday	Test	Study

W1 (1)

① Nose – only externally visable part of the respiratory system

② External Nares (nostrils) = Air first enters here

③ Interior of the nose – Nasal cavity which is divided by the septum



④ Pharynx – "Throat" – common pasageway for food and air

⑤ Larynx - "Voice box" – Routs air and food into the correct pasageways
– Plays a role in speech

⑥ Trachea - "Windpipe" –

⑦ Primary Bronchi – formed by the splitting of the trachea

⑧ Lungs – Right lung = 2 lobes Left lung = 3 lobes

Nose - holes are known as the external nairs or nostrils
up into the nose is the nasal cavity which is split in half by the nasal septum
↳ "Deviated septum"

Olfactory sensors are just below the ethmoid bone in the superior nasal cavities
↳ sense of smell

Respiratory mucosa - the rest of the mucosa lining
- network of thin ~~walls~~ walled veins that warms the air
- Many nose bleeds
- moistens the air
- traps bacteria

Ciliated cells in the ~~nasal~~ nasal mucosa moves contaminated ~~mucus~~ mucus back toward the pharynx and is swallowed to be digested by stomic juices

On cold days, ciliated cells are slyggish so the mucus doesn't travel well = runny nose

Walls of the nasal cavity have three lobes = conchae
Superior, middle, inferior
→ increase surface area to warm the air and trap bacteria

Separated from the oral cavity (mouth) by the palate
Anterior is the hard palalate and posterior soft palate

Nasal cavity is surrourded by the paranasal sinuses
1) Frontal
2) Ethmoid
3) Sphenoid
4) Maxillary

Pharynx ≈ 13cm long

(5)

- Commonly called the throat
- Common passageway to air and food
- Attaches to the nasal cavity through the internal nares
- Superior is the nasopharynx down to the oropharynx and finally the laryngopharynx – which connects to the larynx
- Food and air will separate – air into the lungs and food into the esophagus
- Auditory tubes drain the middle ear into the nasopharynx
- 3 types of tonsils in the pharynx
  - pharyngeal tonsils – adenoid – nasopharynx
  - palatine tonsils – oropharyns – end of the soft palate
  - lingual tonsils – base of the tongue
- Uvula

Larynx

Voice box - sends air and food in the right direction

Inferior to the pharynx

- formed by 8 rigid hyaline cartilages
  - + 1 elastic cartilage - the epiglotis
- largest piece of cartilage contributing to the larynx is the thyroid cartilage
  - ↳ adam's apple

- when you swallow food or liquid the larynx moves up to the epiglottis which forms a lid over the opening of the larynx so the food goes into the esophagus.
- "wrong pipe" cough reflex

- part of the membrane forms a pair of folds - vocal folds
  - also called true vocal cords
  - vibrate with expelled air
  - slit between the vocal folds is called the glottis

Trachea

windpipe

≈ 10-12 cm

lined with ciliated mucosa

cilia beat continuously against the flow of incoming air

get rid of mucus

reinforced by c shaped rings of hyaline cartilage

1) — keeps it open

2) allows the trachea to squish when a big piece of food is swallowed

Heimlich maneuver

tracheostomy

Primary Bronchi

-division of the trachea

Right is wider, shorter, and straighter so food gets in there more often

By the time air reaches - it's warm and clean

Lungs

Occupy the Thoracic cavity except for the mediastinum
- houses the heart
  great blood vessels
  bronchi
  esophagus

Apex - just below the clavicle

Base - broad lung area resting on the diaphragm

Lung surface lined with the visceral pleura

Thoracic cavity is lined by the parietal pleura
- Both produce pleural fluid

Bronchi divide in bronchioles
- bronchial or respiratory tree

Terminal bronchioles lead into respiratory zone structures
eventually terminate in alveoli (air sacs)

Respiratory zone - bronchioles
alveolar ducts
alveolar sacs
alveoli
} gas exchange

Conducting Zone Structures

Millions of clustered alveoli - like bunches of grapes

Lungs = mostly air space

The Respiratory Membrane

Week 2

In the alveoli the walls are mostly made up of a single layer of squamous epithelial cells

this type of epithelium usually forms membranes where filtration or an exchange of materials occur

Tissue paper is much thicker than this layer.

Alveolar pores connect neighboring alveolar (air) sacs

this also allows air an alternate route to the alveolar sacs

External surface is covered in a "cobweb" of pulmonary capillaries — What is pulmonary?
What is cappilary?

Alveolar walls + capillary walls + fused basement layers
= respiratory membrane
(air blood barrier)

Air flows on one side and blood flows on the other

Gas exchange occurs by diffusion through the resp membrane

Oxygen passes from the alveolar air into the capillary blood and CO_2 leaves the blood and goes to the gas-filled alveolus

Estimated that the alveolar walls of a healthy man is (2) W2
50 to 70 square feet – 40 times greater than the surface area.
Final line of defense in the respiratory system is in the alveoli

Macrophages "dust cells" wonder in and out of the alveoli picking up bacteria, carbon particles, and other debri

Also, there are colboidal cells – very different – produce lipid molecule called surfactant – coats the alveolar surface that is exposed to gas.

Respiratory Physiology

4 distinct events occur – collectively known as respiration

(1) Pulmonary ventilation – Air must move into and out of the lungs so that the gases in the air sacs are continually changed.
Pulmonary ventilation is commonly known as breathing

(2) External Respiration
Gas exchange between the pulmonary blood and the alveoli must take place

(3) Respiratory gas transport
Oxygen and CO_2 are transported to and from the lungs and body tissues via the bloodstream

W2 (3)

④ Internal Respiration

At systemic capillaries, gas exchanges must be made between blood and tissue cells

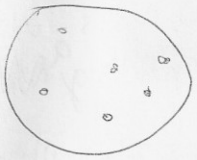
First two steps are the responsibility of the respiratory system but all four are needed for gas exchange

Mechanics of Breathing

Rule to to remember the mechanics of breathing

Volume changs lead to pressure changs, which lead to the flow of goes to equalize the pressure.

Gas expands to fill the container



Pressure is created by the gas molecules hitting each other and the walls of the container

↓V ↑P ↑V ↓P

2 Phase of breathing

1. Inspiration
2. Expiration

Inspiration

W2 (4)

Inspiratory muscles
- diaphragm
- external intercostals

IM contract and the thoracic cavity increases in size

When the diaphragm contracts it's dome shape flattens moving inferior creating more height space (13.1)

External Intercostals cotract and lift the rib cage and pushes the sternum forward.

↑ thoracis cavity - anter posterior and lateral dimensions expand

Pleuras are attached so the lungs also expand. This ↑ V so P↓ Creating a partial vacuum

Lung P is less than atmospheric pressure to air rushes in

this is why climbers have difficulty breathing

Air moves until both pressures are equal. Atmospheric pressure is lower

Expiration

W2 (5)

in healthy people is due more to the elasticity of the lungs than from muscle contraction

Inspiratory muscles relax and the Volume of the thoracic cavity decreases. So pulmonary volume also decreases

$$\downarrow V = \uparrow P$$

- so pulmonary pressure is higher than atmospheric pressure so air flows out.

Normally expiration is passive but...

if the respiratory passage ways are narrowed by spasms of the bronchides (asthma) or are clogged with mucus or fluid (chronic bronchitis or pneumonia) expiration is active.

this is forced expiration ① Internal intercostal muscles are activated to help depress the rib cage and decrease the thoracic volume

② Abdominal muscles contract to help force air from the lungs by squeezing the abdominal organs into the diaphragm

Pressure in pleural space is negative (less than atmosphere) if this equalizes the lung collapses (recoil)

Nonrespiratory Air Movements

W2 (6)

Coughs and sneezes help remove debris from passages

Laughing and crying reflect emotions

—mostly a result of a reflex activity.

Cough.

1. Deep breath
2. glottis closes
3. Air is forced superiorly from lungs
4. Glottis opens suddenly

clear lower resp tract

Sneeze

1. Air is directed through nasal cavity
2. Uvula closes oral cavity

clear upper resp tract

Crying

1. Inspiration
2. Release of air in a number of short breaths

Primary emotional also to clean out eyes

Laughing

1. Inspiration
2. Release of air in a number of short breaths

Hiccups—spasms of the diaphragm.

Initiated by irritation of the diaphragm or phrenic nerves which serves the diaphragm

Yawn — Very deep inspiration

—once thought to be to get more oxygen

—now a questioned theory

W2 (7)

Normal quiet breathing ≈ 500 mL of air
This is the tidal volume (TV)

You can forcibly inhale much more

Inspiratory reserve volume (IRV)
≈ 2100 mL – 3200 mL

Forcibly exchale expiratory reserve volume (ERV)
≈ 1200 mL

Even after you breath out all the way 1200mL remains
residual volume
① Allows gas exchange to continue between breaths
② keeps alveoli open.

Total amount of exchangable air is the Vital capacity (VC)
≈ 4800mL

Deadspace volume ≈ 150mL never reach your alveoli
functional volume ≈ 350mL

Respiratory Sounds:

stethoscope

Bronchial Sounds – air rushing through the trachea & Bronchi

Vesicular breathing sounds – as air fills the alveoli

External Resp – Hemoglobin

Gas Transport.

Transported in lungs 2 ways

1. O_2 attaches to hemoglobin to make oxyhemoglobin HbO_2
2. Small amount dissolved in the plasma.

CO_2 is in the plasma as a bicarbonate ion HCO_3^-

Small amount is in the RBCs

Bicarbonate + $H^+ \rightarrow H_2CO_3 \rightarrow CO_2 + H_2O$

carbonic acid

Internal Resp.

Breathing Control

muscles are controlled by nerve impulses from the phrenic and intercostal nerves

2 Locations of Breathing Control in Breathing

Medulla – sets the basic rate of breathing
- contains self-exciting inspiratory center

Pons – smooths the basic rhythm of the Medulla

Between the Medulla and the pons sets the rate at 12–15 respirations/minute

Normal respiratory rate is called eupnea.

Bronchioles and alveoli have stretch receptors that
- Sense overinflation – explode lungs
- stretch receptors send message to the medulla
- ends inspiration and begins expiration

Exercise – breathe deeper and more vigorously
- called hypernea
- rate doesn't increase
- expiration becomes active

Factors W2 (10)

Physical

-talking, coughing, exercise, increased body temp ↑breath

Volition - conscious control

singing, swallowing, holding breath,

only hold out so long - involuntary control takes over

blood O_2 ↓

blood pH ↓

Emotional

Gasping - Scary movie

chemical Factors

CO_2 and O_2 levels

need to get rid of CO_2 is the main reason to cause to breath

O_2 is stimulus - extremely bw

People with ~~amphezema~~ emphysema or chronic bronchitis

CO_2 is always high so not a trigger

Hyperventilation - ~~CO2~~ CO_2 ↑ + pH ↓ - hyper is triggered

H is is different from hypernea - blows off CO_2

and decreases carbonic acid

① Name the three lobes in the nasal cavity.

② This structure is commonly called the throat.

③ The respiratory membrane lines which structure?

④ What are the 4 events known as respiration?

⑤ List the six non-respiratory air movements

⑥ During normal quiet breathing you breath in and out 500mL of air. What is this called?

⑦ ~~Total Lung Volume~~ Vital capacity is the sum of which volumes? What is the total volume?

⑧ ~~What are the 2 locations in the Brain involved in breathing?~~

⑨ What is volition?

⑩ ~~What~~ Emphysema or chronic bronchitis prevents a persons body from sensing what?

⑧ The Medulla and the pons are responsible for setting the normal respiration rate. What is this rate and what is it called?

X-tra

① When a ~~pilot~~ diver suffers from the Bends what is in the blood and what is the cure

② ~~What is the cure~~

Chapter 13 Test - Vert.

Diagram - Label A - J (structures)

Essays

(1) Fully describe the: ~~physical event that~~ mechanics of breating

(2) Fully explain Respiratory Gas Transport (Both Gases)

Vertebrate Anatomy Honors
Chapter 13 Quiz
March 23, 2007
Ms. Kinnal

1) What structure divides the nasal cavity?
2) Name the three regions of the Pharynx?
3) Which structure drains fluid from the middle ear to part of the pharynx?
4) What are the two functions of the respiratory mucosa?
5) How does the larynx stop food from flowing into the airway?
6) Which structure is known as the windpipe?
7) What are two medical treatments for an obstructed airway?
8) What is the difference between the two bronchi?
9) Name the membranes covering the lungs and the thoracic cavity?
10) What is the only location of gas exchange?
11) Describe the pathway of airflow through the respiratory system.

Vert.

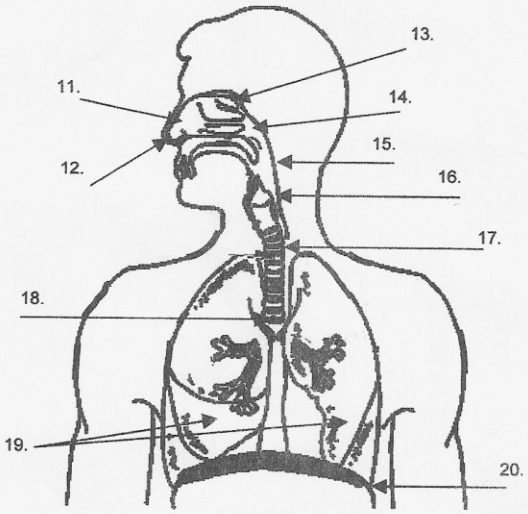
Answer Key Chapter 13 Quiz

1) Septum
2) Naso, oro, laryngo 5
3) ~~warm air, trap bacteria~~ Auditory Tubes
4) warm air, trap bacteria
5) Moves up to the epiglottis
6) Trachea
7) heimlich, tracheotomy
8) Right, shorter, wider, straighter
9) Parietal visceral
10) Respiratory Zone
11) ① Nose 6
② Ex Nares 6
③ Nasal Cavity 6
④ Pharynx 6
⑤ Larynx 6
⑥ Trachea 6
⑦ Primary Bronchi 6
⑧ Lungs 6

Chapter 13 Test
Vertebrate Anatomy Honors
3/30/07
Ms. Kinnal

1) Name the three lobes in the nasal cavity.
2) This structure is commonly called the throat.
3) The respiratory membrane lines which structure?
4) What are the 4 events known as respiration?
5) List the six non-respiratory air movements.
6) During normal quiet breathing you breath in and out 500mL. What is this called?
7) Vital capacity is the sum of which volumes? What is the total volume?
8) The Medulla and the Pons are responsible for setting the normal respiration rate. What is this rate and what is it called?
9) What is volition?
10) Emphysema and chronic bronchitis prevents a person's body from sensing what?

11 - 20) Label the structures in the diagram below.



Essays
1) Completely describe the mechanics of breathing.
2) Fully explain Gas Transport.

Vert Chapter 13 Test - Answer Key

1 Superior, Middle, Inferior Conchae
2 Pharynx
3 Alveoli
4 Pulmonary Ventilation, External Respiration, Gas Transport, Internal Respiration
5 Coughing, Sneezing, Laughing, Crying, Yawning, Hiccuping
6 Tidal Volume
7 TV + IRV + ERV / 4800 mL
8 12-15 resp/min / Eupnea
9 Concious control of breathing
10 High levels of CO_2
11 Nose
12 External Nares
13 Nasal Cavity
14 Internal Nares
15 Pharynx
16 Larynx
17 Trachea
18 Primary Bronchi
19 Lungs
20 Diaphragm

Beach

Appendix F: Anatomy: Digestive System

Chapter 14: The Digestive System

Mouth
Teeth
Tongue

Salivary Glands
1) Parotid
2) Sublingual
3) Submandibular

Pharynx

Stomach

Pancreas

Small Intestine
- Duodenum
- Jejunum
- Ileum

Large Intestine
- Tranverse Colon
- Descending Colon
- Ascending Colon
- Cecum
- Sigmoid Colon
- Rectum

Anus

Gastrointestinal Tract (GI)

mouth
pharynx
esophagus
stomach
small intestine
large intestine

Mouth

- lips protect
- oral cavity proper - area inside the teeth

Teeth

- Chew food

1st set
deciduous (baby or milk teeth)
6 months - 2 years
Lower central incisors

2nd set 6-12 years
Permanent teeth
roots of 1st are reabsorbed
Includes 2 sets of molars
3rd is wisdom teeth
17-25
32 permanent

4 types
Incisors - cutting
Canines - tearing or piercing
pre molars > grinding
molars

Pharynx
- 3 parts
- two skeletal muscle layers
  - inner longitudinal
  - outter circular

Alternating contractions
peristalsis

Eat upside down
Esophagial cancer
Feeding Tube
Chiken with no head
Throwing up

Esophagus

25 cm

Mucosa - innermost
- lines cavity

Surface epithelium - simple tissue
lamina propria - connective tissue

Submucosa
- Soft connective tissue

Muscularis externa
inner - circular
outter - logitudinal

Serosa - outermost
single layer visceral peritoneum - serous fluid
↳ continues from parietal peritoneum mesentery

Nerves
submucosal nerve plexus

mysenteric nerve plexus

Autonomic
GI tract organs

on rniehsrt
oxyetd

nearly all absorption occurs in sm. int.

3 structures to do the job

1) microvilli – tiny projections – enzymes break down complex sugars

2) villi – finger like projections – capillary bed
– lacteal

3) circular folds – deep folds of mucosa and sub mucosa

why?
– do not disappear like rugae

food travels in by active transport to blood

except lipids (fats) – diffusion

lessen towards end

lymphatic tissue increases – more bacteria

indigestable food moves on

Diseases - gastroenteritis

Appendicitis

Celiac's disease

Crohn's disease - inflamation

400,000 - 600,000

Infarction

~~Irritable~~ Irritable Bowel

Vertebrate Anatomy Honors
Digestive System Test
Ms. Kinnal
5/2/07

Answer the following questions:

1) What are the four taste sensations?
2) Name the four types of teeth.
3) Name the three slivary glands.
4) How long is the esophagus?
5) Name the three muscle layers in the stomach.
6) What are the four regions of the stomach?
7) When the stomach is full how much will it hold? (In Liters, not gallons)
8) Where is pepsin made?
9) When food leaves the stomach broken down it is known as what?
10) Which organ in the digestive system is known as the major digestive organ?
11) Nutrients travel into the capillaries by what process?
12) Lipids travel into the capillaries by a different process known as?
13) What is the function of the lacteals?
14) What connects the small intestine to the large intestine?
15) What is the main function of the large intestine

Long Answer

16) Name the path of food through the body.

Essays:

1) Completely explain chemical digestion in the small intestine.
2) Describe a digestive disease in detail. (Causes, symptoms, cure if any)

1) Bitter, Sour, Salty, Sweet
2) Canines, Incisors, Premolars, Molars
3) Parotid, Submandibular, Sublingual
4) 25 cm
5) Long, circ, oblique
6) Body, Fudus, Cardiac Region, Pylorus
7) 4 liters
8) Gastric glands
9) chyme
10) Sm. Int
11) Active Transport
12) Diffusion
13) Rid the body of bad nutrients
14) Ileum / Ileocecal valve
15) Absorb water
16) Mouth, pharynx, esophagus, stomach, Sm. Int, Lg Int

Taste

- testing or judging
- papillae
  - 3 types
    1) filiform - sharp
    2) fungiform - rounded — taste buds
    3) circumvallate
  - taste buds — little hairs through taste pore
    - 3 cranial nerves transmit impulse

4 sensations

tip sweet - sugars, saccharine, some amino acids
hydroxyl groups (OH^-)

sides sour - hydrogen ions or acidity

back Bitter - respond to alkaloids

tip Salty - metal ions

originally believed that different regions had different tastes but not true

Cravings are indicative of balance in body — sugar + salt
carbs + minerals
sour - vitamin C

Olfactory Receptors and the Sense of Smell

- less than most animals - still useful
  - some with a good sense - tea and coffee blenders, wine tasters, and perfumers

thousands of olfactory receptors on roof of each nasal cavity

- cells are neurons with olfactory hairs

Constantly covered in mucus

- when breathing, chemicals in mucus transmits impulses along the olfactory filaments
  - connect to nerve
    - travel to brain

tied to emotional parts of brain

eventually olfactory receptors adjust

Taste relies on smell – aromas

without smell coffee would only taste

temperature and texture – tapioca pudding

cold french fries

spicy foods – pain receptors

Stomach

C - shaped

Cardiac region - near the heart

Cardioesophageal sphincter
- food enters

fundus - expanded part
body - mid portion
pylorus - terminal

pyloric sphincter - connection to small intestine

25 cm

HW

full = 4 liters

empty - mucosa collapses on itself - folds = rugae

lesser omentum - double layer from liver to stomach

greater omentum - extends from peritoneum

Has circular and longitudinal layers - third layer in the muscularis externa
1. churns
2. mixes
3. pummels...

food, so it is broken down into smaller pieces

Chemical Breakdown

lining is simple columnar epithelium - large amounts of mucus

millions of gastric pits → gastric glands → make gastric juice

chief cells in gastric pits → produce pepsinogens

parietal cells make HCL to make the contents of stomach more acidic and set off the enzyme). At this point pepsinogen becomes pepsin

Chyme - food at end of stomach

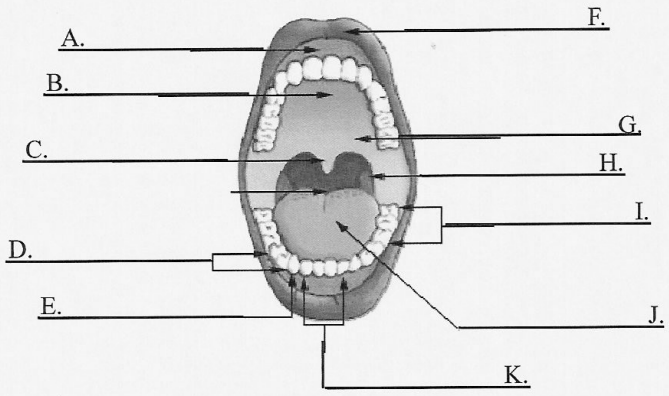
Digestive System

You've been working hard at school all day and now you're home and it's time for a snack. You grab an apple and a Hershey's…they'll cancel each other out (NOT really). Let's follow them on their journey through the digestive system.

MOUTH

First stop is your mouth. You have to bite and chew your food before it can enter the digestive system.

Label the Three Major Sections of the Mouth (Be specific)



Matching

Using the letters from the diagram, match the structure to it's function.

1._____ This structure protects your oral cavity.

2._____ This hangs off of your soft palate and is responsible for your gag reflex.

3._____ These cut food when you bite.

4._____ This moves food to your teeth as you chew.

5._____ You have only 4 of these in your mouth.

6._____ These are the last permanent teeth to come in.

7._____ This structure is created by the maxilla.

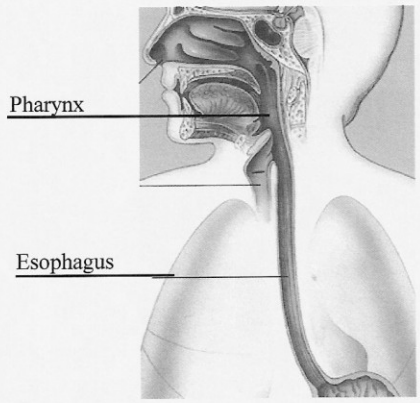
8._____ These teeth are similar to two other sets of teeth. There are 8 of them in your mouth.

9._____ This is where gingivitis occurs.

10._____ There are three sets of these structures but only one is visible.

PHARYNX AND ESOPHAGUS

Next your afternoon snack will enter your digestive system and start the trip to breakdown by traveling though the pharynx and the esophagus.



1. Identify the types of muscle:

Pharynx

Inner _____

Outer_____

Esophagus

Inner _____

Outer_____

2. Put the following in order from the inside of the esophagus out:

Serosa, Muscularis Externa, Submucosa, Mucosa

_____

_____

_____

_____

3. Label the sublayers of each of the following:

Mucosa

_____

_____

_____

Submucosa

_____

Muscularis Externa

_____

_____

Serosa connects to:

_____

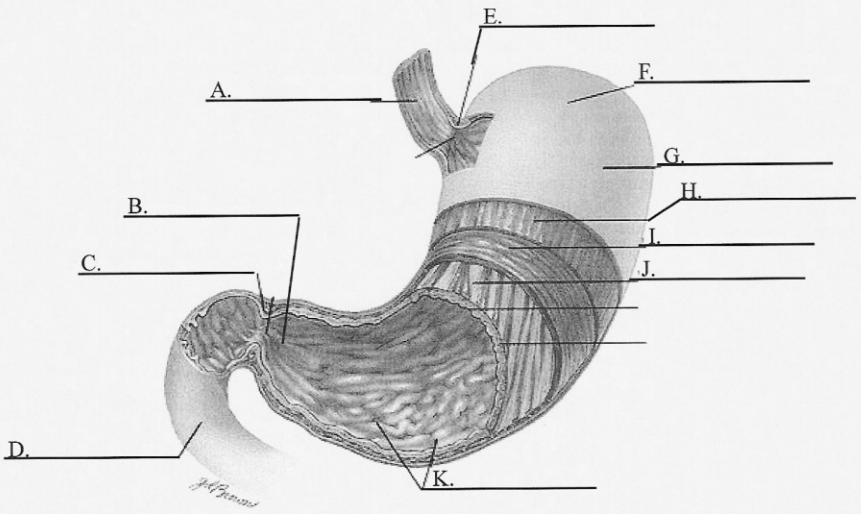
4. Name the phenomena that occurs from the alternate contractions of the muscle layers in the pharynx and esophagus. _____

5. _____ is the length of the esophagus

STOMACH

Now the food must be broken down to be digested.

Label the stomach (Be specific)



1. Name the three muscle layers in the stomach.

_____

_____

_____

2. What three things do the muscle layers do to food?

_____

_____

_____

3. When the stomach is full it holds this amount:

_____

4. _____ _____ cells line the stomach

5. Gastric pits lead to _____ _____

6. Label the chemical equation that occurs to break down food

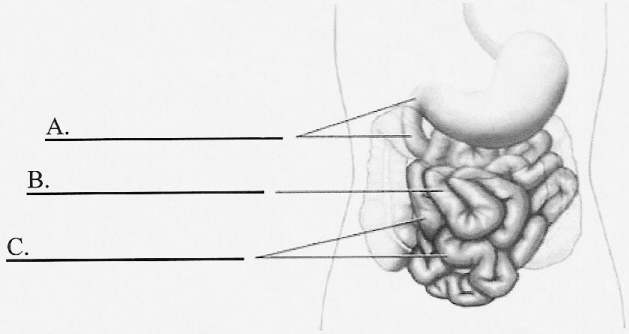
_____ + _____ → _____

7. When broken down food leaves the stomach it is known as _____.

SMALL INTESTINE

After the apple and the Hershey's have been mechanically and chemically broken down in the stomach, chemical digestion can occur in the small intestine.

1. Label the Three Major Sections of the Small Intestine



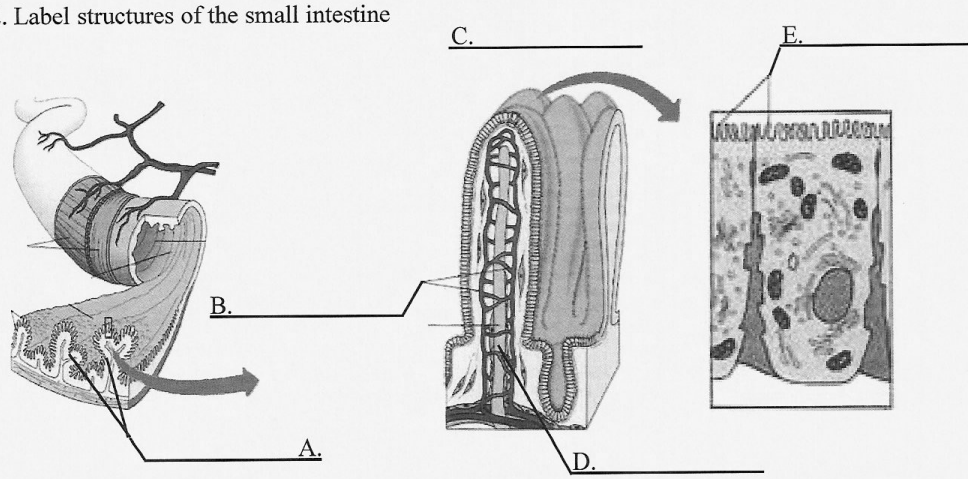
What is the length of these sections?

A. _____

B. _____

C. _____

2. Label structures of the small intestine



3. Name the structures below.

Start of small intestine: _____

End of small intestine: _____

4. Which three organs produce digestive enzymes?

_____

_____

_____

5. Nutrients enter the capillaries by this process

_____

6. Except for lipids which use this process

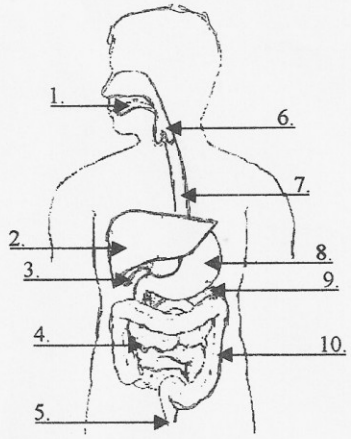
_____

7. How long does it take for food to pass through the small intestine?

_____

Vertebrate Anatomy
Digestive System Quiz
Ms. Kinnal
4/26/07

A. Label the Diagram Below



B. Answer the following short answer questions.

1) These protect the oral cavity.

2) What is the difference in the muscle layers of the pharynx and the esophagus?

3) Name the four layers of the esophagus.

4) Name the sphincter at the top of the stomach.

5) What connects the stomach to the small intestine?

6) Name the folds of the mucosa in the stomach.

7) Name the three regions of the small intestine.

8) What two structures are inside villi?

9) What is the main function of microvilli?

10) How long does food take to pass through the small intestine?

11) Villi are attached to what structures?

12) Name the 4 parts of the colon.

13) What three structures are approximately 25 cm long?

14) What is the phenomena created by the alternate contracting of the muscle layers in the pharynx and the esophagus?

15) Collectively the mouth, pharynx, esophagus, stomach, small intestine, and large intestine are known as what?

Vert Digestive System Quiz

Label
1 Mouth
2 Liver
3 Gallbladder
4 Small Intestine
5 Rectum
6 Pharynx
7 Esophagus
8 Stomach
9 Pancreas
10 Large Intestine

Questions

1 Lips / Labia
2 they switch
3 Mucosa, submucosa, muscularis externa, serosa
4 cardioesphageal
5 pyloric sphincter
6 rugae
7 duodenum, jejunum, ileum
8 Lacteals and capillaries
9 break down complex sugars
10 3-6 hours
11 large circular folds
12 ascending, transverse, descending, sigmoid
13 duodenum, stomach, esophagus
14 peristalsis
15 Gastrointestinal tract

Appendix G: Anatomy: Lymphatic System

Lymphatic System

- Aids Cardiovascular
  - lymphatic vessels
    - ↳ Pick up excess fluid
      - ↳ lymph
  - One way system, brings fluid back to heart
    - ↳ mostly water
  - lymph capillaries woven into capillaries
  - Cells overlap each other creating valves - one way doors
  - Valves open when outside pressure is higher
  - Bacteria, viruses, cell debris can't enter blood - can travel in lymphatic vessels
  - Use the vessels to travel but lymphatic vessels travel through nodes and are cleansed

- aids immune system
  - lymphoid tissues and organs
  - lymph nodes - remove foreign material
    - cluster along lymphatic vessels
  - Spleen - filters blood
  - thymus - produces hormones
  - tonsils - trap and remove
  - Peyer's patches - bottom small intestine

Lymphatic System

- Aids Cardiovascular
  - lymphatic vessels
    - ↳ Pick up excess fluid
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  - Use the vessels to travel but lymphatic vessels travel through nodes and are cleansed

- aids immune system
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  - lymph nodes - remove foreign material
    - cluster along lymphatic vessels
  - Spleen - filters blood
  - thymus - produces hormones
  - tonsils - trap and remove
  - Peyer's patches - bottom small intestine

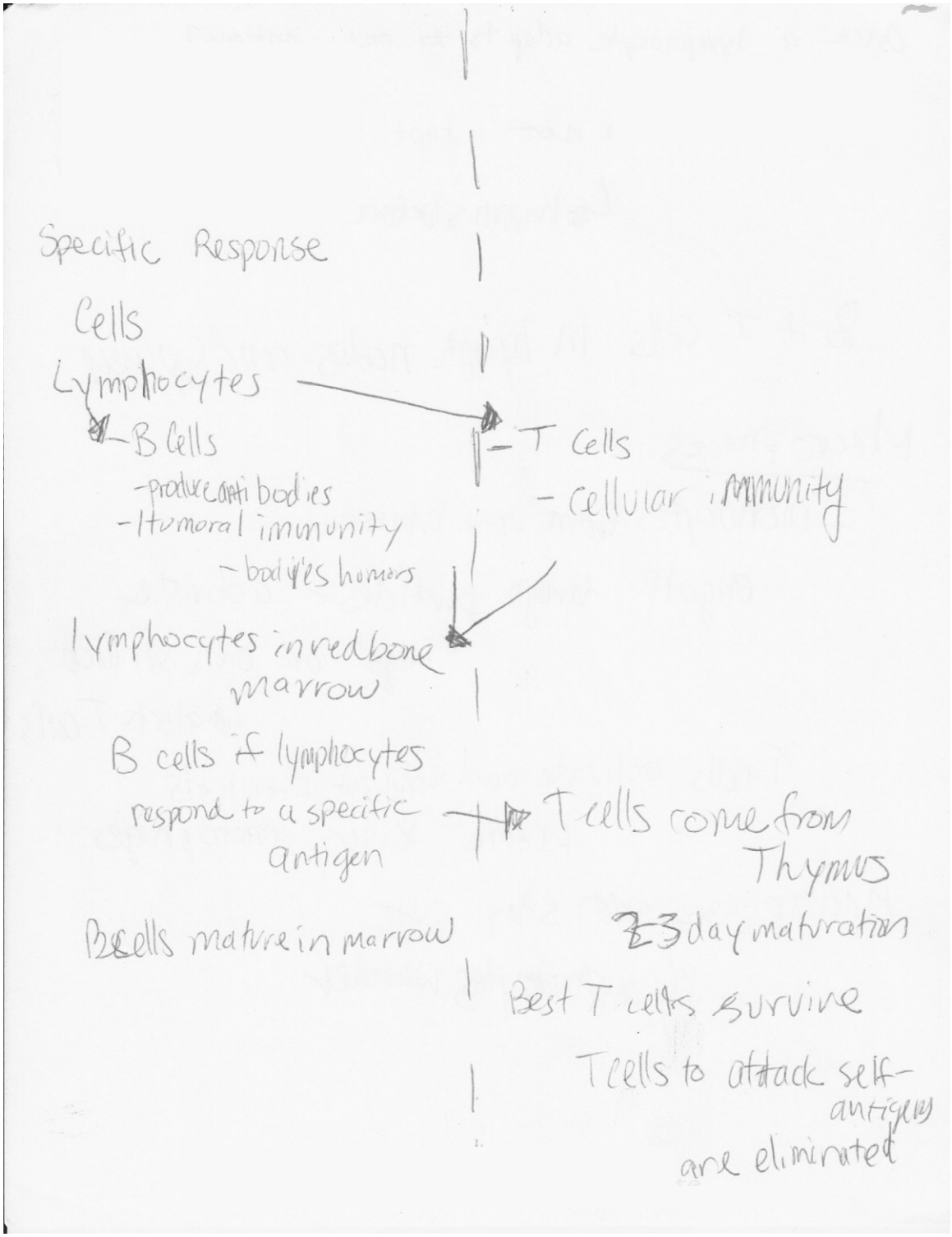
Two Major ducts

right lymphatic ducts, rt arm, rt side of head, and thorax

thoracic duct - rest of the body

→ both into subclavian vein

→ no pump like veins


Specific Response
Cells
Lymphocytes
B cells
- produce antibodies
- Humoral immunity
- bodies homers
T Cells
- Cellular immunity
lymphocytes in red bone marrow
B cells if lymphocytes respond to a specific antigen
T cells come from Thymus
3 day maturation
Best T cells survive
T cells to attack self-antigens are eliminated
B cells mature in marrow

Once a lymphocyte adapts to one antigen

lymphocyte does not adapt to antigen when exposed
↳ happens before

B + T cells in lymph nodes and spleen

Macrophages

- monocytes from bone marrow

engulf foreign particles - activate "flags" on own surface
↳ alerts T cells

T cells activate and send out chemicals
create Killer macrophages

Macrophages stay put
lymphocytes wander

2 Body Defenses

Non-Specific

- Protects from all foreign objects
- Mostly mechanical protection from pathogens - microorganisms

1st defense - skin + membranes → produce chemicals

Hair in nose

2nd defense - cells and chemicals

Phagocytes - macrophage or neutrophil

Cytoplasmic extensions grab foreign body → vesicle → lysosome

Natural Killer cells

- kill cancer cells and virus infected body cells
- recognize signals

Specific ~~immune system~~

Inflammatory Response

- response to injured tissue
  - → physical trauma
  - → intense heat
  - → irritating chemical
  - → viruses
  - → bacteria

4 signs

redness
heat
swelling
pain

Injured cells release histamine and kinins - chemotaxis

- capillaries dilate
- pain receptors activate
- phagocytes are attracted

Fever

Specific Defense

- immune response

immunes systen recognize ~~foreign~~ antigens.

Antibody is created once your exposed

all cells have protein on the surface - body recognizes it

doesn't - trigger a response in self.

WBC

5 Types

Neutrophils – phagocytes #↑ short term infection

Eosinophils – kill parasites #↑ during allergies

Basophils – granules contain histamines

Lymphocytes – B + T

Monocytes – long term clean up

#↑ during chronic infections

Antibodies

↳ from B cells

5 classes – all have the same basic structure

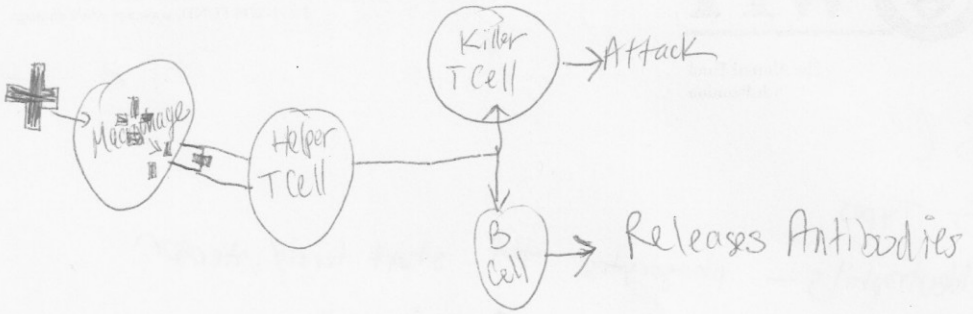
4 a.a. chains 2 heavy 400 a.a.
2 light ≈200

T or Y shaped

Variable region – changes b/c antigen site to bind

Constant region – doesn't change

↳ stem


Killer T Cell
Attack
Macrophage
Helper T Cell
B Cell
Releases Antibodies

Appendix H: Teaching Challenges

period 5

24

1. —A
2. ~~pharynx~~ pharynx ✓
3. lungs —A
4. inspiration, expiration. —A
5. coughing, sneezing, ~~yawning~~, laughing, crying, ~~hiccups~~ ✓
6. Resting volume —A
7. it is the sum of the minimum ~~air~~ you can hold, ~~the~~ A you can exhale, and ~~the~~ you can inhale
8. —C
9.
10. CO_2 levels ✓
11. internal nares —A
12. external nares ✓
13.
14. — —20
15.
16. pharynx
17. ~~larynx~~ larynx
18. Bronchi ✓
19. Lungs ✓
20. diaphragm ✓

(2) Air enters the respitory tract due to the contraction of the diaphram. Air travels to the Avioli sacs and O_2 is diffused into the capillaries. O_2 bonds with hemoglobin in the blood cells. This bond forms oxyhemoglobin. This is transported through the circilitory system. At the O_2 oxyhemoglobin releases the Oxygen as cells start to diffuse CO_2 out ward. Some CO_2 dissolves into the blood plasma & other bond with hemoglobin. This helps the lungs can happen. H_2O combines with CO_2 to make Carbonic acid. This then releases a H^+ ion and become Bicarbonate Bicarbonate bonds with hemoglobin forming Carbo-hemoglobin* (not the right word). This travels back to the Avioli sacs within the lungs and the process reverses until CO_2 is formed again. This is diffused into the avioli to be exhaled, and the whole process repeats itself.

(3) I'm not wasting another minute on your test. I do not respect you but I do have respect for the subject. You are rude and full of yourself.

Appendix I: Log of Hours

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 10/23/06

	Activity	Subject Area	Hours	Signature
Monday	Observation	Biology	1	BK
		Chemistry	1	BK
		Anatomy	4	BK
Tuesday				
Wednesday				
Thursday				
Friday				
Totals		Direct Hours		
		Observation Hours	6	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 10/30/06

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday	Observation	Anatomy	2	BK
Wednesday				
Thursday				
Friday				
Totals		Direct Hours		
		Observation Hours	2	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 11/13/08

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday	Observation	Anatomy	2	BK
-Wednesday				
Thursday				
Friday				
Totals		Direct Hours		
		Observation Hours	2	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 11/27/06

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday				
Wednesday	Observation	Anatomy	2	
Thursday				
Friday				
Totals		Direct Hours		
		Observation Hours	2	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 1/15/07

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday	Observation	Anatomy	4	BK
Wednesday				
Thursday	Observation	Biology	1	BK
		Anatomy	2	BK
Friday				
Totals		Direct Hours		
		Observation Hours	7	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 1/15/07

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday	Observation	Anatomy	4	BK
Wednesday				
Thursday	Observation	Biology	1	BK
		Anatomy	2	BK
Friday				
Totals		Direct Hours		
		Observation Hours	7	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 1/22/07

	Activity	Subject Area	Hours	Signature
Monday	~~Observation~~	~~Biology~~		
Tuesday	Observation	Biology	1	BK
		Anatomy	2	BK
Wednesday				
Thursday				
Friday				
Totals		Direct Hours		
		Observation Hours	3	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 1/29/07

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday	Observation	Biology	1	BK
		Anatomy	2	BK
Wednesday				
Thursday	Observation	Biology	1	BK
		Anatomy	2	BK
				BK
Friday				
Totals		Direct Hours		
		Observation Hours	6	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 2/5/07

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday	Observation	Biology	1	BK
		Anatomy	2	BK
Wednesday				
Thursday	Observation	Biology	1	BK
		Anatomy	2	BK
Friday				
Totals		Direct Hours		
		Observation Hours	6	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 2/12/07

	Activity	Subject Area	Hours	Signature
Monday				
Tuesday	Observation	Biology	1	
		Anatomy	1	
Wednesday				
Thursday				
Friday				
Totals		Direct Hours		
		Observation Hours	2	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 3/5/07

	Activity	Subject Area	Hours	Signature
Monday	Observation	Biology + Anatomy	5	BK
Tuesday	Observation	Biology and Anatomy	5	BK
Wednesday	Observation	Biology and Anatomy	5	BK
Thursday	Observation	Biology and Anatomy	5	BK
Friday	Observation	Biology and Anatomy	5	BK
Totals		Direct Hours		
		Observation Hours	25	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 3/12/07

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Biology	1	BK
	Observation	Anatomy	4	BK
Tuesday	Teaching	Biology	1	BK
	Observation	Anatomy	4	BK
Wednesday	Teaching	Biology	1	BK
	Observation	Anatomy	4	BK
Thursday	Teaching	Biology and Anatomy	5	BK
Friday	Teaching	Biology and Anatomy	5	BK
Totals		Direct Hours	13	
		Observation Hours	12	

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 3/19/07

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Biology and Anatomy	5	BK
Tuesday	Teaching	Biology and Anatomy	5	BK
Wednesday	Teaching	Biology and Anatomy	5	BK
Thursday	Teaching	Biology and Anatomy	5	BK
Friday	Teaching	Biology and Anatomy	5	BK
Totals		Direct Hours	25	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 4/2/07

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Biology and Anatomy	5	BK
Tuesday	Teaching	Biology and Anatomy	5	BK
Wednesday	Teaching	Biology and Anatomy	5	BK
Thursday	Teaching	Biology and Anatomy	3	BK
Friday				
Totals		Direct Hours	18	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 4/9/07

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Biology and Anatomy	5	BK
Tuesday	Teaching	Biology and Anatomy	5	BK
Wednesday	Teaching	Biology and Anatomy	5	BK
Thursday	Teaching	Biology and Anatomy	5	BK
Friday	Teaching	Biology and Anatomy	5	BK
Totals		Direct Hours	25	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 4/23/07

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Biology and Anatomy	5	BK
Tuesday	Teaching	Biology and Anatomy	5	BK
Wednesday	Teaching	Biology and Anatomy	5	BK
Thursday	Teaching	Biology and Anatomy	5	BK
Friday	Teaching	Biology and Anatomy	5	BK
Totals		Direct Hours	25	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 4/30/07

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Biology and Anatomy	5	BK
Tuesday	Teaching	Biology and Anatomy	5	BK
Wednesday	Teaching	Biology and Anatomy	5	BK
Thursday	Teaching	Biology and Anatomy	5	BK
Friday	Teaching	Biology and Anatomy	5	BK
Totals		Direct Hours	25	
		Observation Hours		

Worcester Polytechnic Institute
Teacher Certification Program
Practicum Log

Name: Liz Kinnal

Week Of: 5/7/07

	Activity	Subject Area	Hours	Signature
Monday	Teaching	Anatomy	4	BK
Tuesday	Teaching	Anatomy	4	BK
	Observation	Biology	1	BK
Wednesday	Teaching	Anatomy	4	BK
	Observation	Biology	1	BK
Thursday	Teaching	Anatomy	4	BK
Friday				
Totals		Direct Hours	16	
		Observation Hours	2	