View New District Course

Course Title: Advanced Geology A/B (P)

Teacher Contact

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* **Was this course Previously Approved by UC?** ☐ Yes ☑ No

* **Course Title:** Advanced Geology A/B (P)

* **Seeking "Honors" Distinction:**

- ☑ No
- ☐ Yes, AP
- ☐ Yes, IB (higher level)

☐ Yes, IB (standard level)

☐ Yes, Other Honors

*** Subject Area:**

☐ a - History / Social Science

☐ b - English

☐ c - Mathematics

☐ d - Laboratory Science

☐ e - Language Other than English

☐ f - Visual & Performing Arts

◉ g - Elective

*** Category:** Science-Physical

*** Grade Level for which this course has been designed:** ☐ 9 ☐ 10 ☑ 11 ☑ 12

*** Unit Value:**

☐ 0.5 (half year or semester equiv.)

◉ 1.0 (one year equiv.)

* Schools selected for this course:

Select All: ☐

☐	053302	Delta High School (Santa Maria, CA)
☐	053847	Pioneer Valley High School (Santa Maria, CA)
☑	053303	Righetti (Ernest) High School (Santa Maria, CA)
☐	053305	Santa Maria High School (Santa Maria, CA)

* **Transcript Title / Abbreviation:** **Course Code**

Ad Geology A (P)	SC6631	

* Schools selected for this abbreviation:

☑ 053303 Righetti (Ernest) High School (Santa Maria, CA)

Ad Geology B (P)	SC6632	

* Schools selected for this abbreviation:

☑ 053303 Righetti (Ernest) High School (Santa Maria, CA)

* **Is this course classified as a Career Technical Education:** ☐ Yes ☉ No

If CTE:

Name of Industry Sector:

Name of Career Pathway:

* Brief Course Description
(If school has a catalog enter the description that is in the catalog.)

This is a two semester college preparatory laboratory science course designed to teach students about Earth space science. Students will learn about the tectonic processes that shape the Earth, how the tectonic processes are the driving forces of the Earthâ□™s resources including the formation of fossil fuels and gold deposition, and how those resources are affected by different geologic hazards. Students will use their knowledge of chemistry and build upon this when looking at the physical and chemical properties of rocks, minerals and the Explosivity of volcanoes. Students will learn how to read interpret both geologic maps and cross-sections in order to successfully complete the given projects. There will also be a unit that will cover space science including the big bang theory, stellar evolution including how elements on the periodic table were formed and planetary geology. Hands-on activities labs occupy approximately 40% of the given class time are designed to reinforce student understanding of scientific investigation experimentation within the realm of geologic science.

Pre-Requisites

Successful completion of two years college prepara ◉ Required ○ Recommended

Co-Requisites

None ○ Required ○ Recommended

Context for Course
(optional)

History of Course Development
(optional)

Textbooks

Include list of Primary and Secondary Texts. Make sure to note the books that will be read entirely and those that will be as excerpts.

Textbook information is not necessary if your course is a Visual and Performing Arts,

Advanced Placement or an International Baccalaureate course. Note: Textbooks will not initially display for courses in the VPA / AP / IB areas.

If you wish to add a Textbook for a course click "Add Textbooks".

TEXTBOOK 1

* **Title:**	Earth Science
* **Edition:**	12th
* **Publication Date:**	2009
* **Publisher:**	Pearson-Prentice Hall
* **Author(s):**	Tarbuck, Lutgens, Tasa
* **Usage:**	P
	true

Supplemental Instructional Materials (please describe)

Title: Simon Schusterâ☐™s Guide to Rocks Minerals- Students use this for their rock mineral ID Authors: A. Mottana, R. Crespi, G. Liborio Publishers: Simon Schuster Title: Geology of National Parkâ☐”Students use this for their various research projects Authors: A.Harris, E. Tuttle, S. Tuttle Publishers: Kendall/Hunt Publishing Co. Various videos on earthquakes, volcanoes, the rock cycle, etc. Movie: Contact Movie: Danteâ☐™s Peak Video: Collapse! Video: Discoveryâ☐”Loma Prieta Quake Video: Discoveryâ☐”Mexico City Quake Video: Discoveryâ☐”Kobe, Japan Quake

* Course Purpose

What is the purpose of this course? Please provide a brief description of the goals and expected outcomes. Note: More specificity than a simple recitation of the State Standards is needed.

At the completion of the course, Advanced Geology students will be able to do the following: 1) Students will be able to think critically in order to solve real-world problems by completing standards-based group and individual projects, laboratory experiments and assignments. 2) Students will be able to determine areas which may be threatened by natural disasters, by using learned geologic concepts, when looking for places to live in later life. 3) Students will be able to explain the physical and historical geology of an area around the world whether for school projects or individual vacations.

* Course Outline

Detailed description of topics covered. Show examples of how the text or readings are incorporated into the topics covered.

General Science: Observation vs. Inference **Students to watch and take notes on the video, Collapse. **Students will then write an inference as to why collapses occurred. **Students are to observe coprolites, fossilized poop, and infer how the poop became fossilized and what they can figure out about the animal that left it behind. Metric Conversions **Students will be taking notes on how to do both metric-metric conversions metric-English conversions. **Students will do a lab--How big is our room. During this lab students will create a 1:40 scale model of the classroom and figure out if a 1:40 scale model of a dinosaur could fit in it. **Students will create a 1:20 scale model of their room as a homework assignment. **Students will use their knowledge of metric-English conversions to complete a Dinosaur Dimensional Analysis assignment. **Students will take a quiz on both type of conversions. Density **Students will take notes on density work density math problems. **Students will do a density lab, finding the density of different items. **As a class, we will do a demo on density salinity. Based on this information, students will complete a reproducible lab about density salinity. Astronomy: Stellar Evolution **Although students will be covering stellar evolution during the large standards-based astronomy research project, students will also be doing a stellar evolution comic strip project with this. Standards-based astronomy unit including: Students will be doing an standards-based astronomy project using their book and the internet to research their topic. The topic are from the California State Astronomy Standards. Each group of 3-4 students will research their particular astronomy standard and put together a PowerPoint presentation that is presented to the class. After these, students will put together an individual portfolio of what

theyâ☐™ve learned. Their nightly homework assignments that were done using their textbook are also included in these. Students will use these portfolios to study for their written standards-based astronomy exam. Nuclear fusion, the Sun the formation of the solar system how the earthâ☐™s atmosphere has changed over time. Including how asteroid impacts have had an impact on extinctions throughout geologic time. Galaxies, quasars, black holes, Einsteinâ☐™s Theory of General Special Relativity. **Learning about this concept, students will also learn about: how the Big Bang Theory caused hydrogen, helium lithium formed and about the background radiation of the universe. **Students will also learn that the elements on the periodic table formed through novas supernovas. Formation of the Solar System **Students will take notes about the nebular theory. **Students will read about this concept in their book and use it to help them with the given labs. **Students will create a scaled model of the solar system. Eclipses Phases of the moon **Students will do an eclipse lab and a lab that includes tides phases of the moon. **Watch Contact. Students to observe discrimination/conflicts in movie relate these to their lives. Students to write a 2-3 page, typed paper on discussing this. Constellations Myths **Creating a constellation myth writing. Earth Science Minerals **Give a review of chemistry, especially the Periodic Table of the Elements, Ionic Covalent Bonding, along with physical chemical properties of chemistry. **Review the elements on the Periodic Table of the Elements atomic structures. **Students will use these chemistry concepts to show how a mineral is formed how the crystalline structure of a mineral is associated with this. **Students will complete a crystallography lab and learn how a mineralâ☐™s crystal lattice structure gives metals physical properties such as malleability, fracture cleavage. Physical Chemical Properties of Minerals **Give students notes on minerals, Bowens Reaction Series the Fractionation process. **Students will be reading using their textbooks to understand about minerals, Mohs Hardness Scale and cleavage through reading and written homework assignments. **Students will put minerals in order with Bowens Reaction Series. They will look at the mineralsâ☐™ silica iron content. Students will write down observations of different minerals such as: color, physical characteristics, density, hardness cleavage. Mohs Hardness Scale Cleavage **Students will take notes on the Mohs Hardness Scale, do a homework assignment in their book associated with this concept and do a lab about the hardness of different minerals. **Students will identify minerals using their book and other supplemental mineral classification books. **Students will do a written performance exam on minerals mineral identification. Minerals associated with economic resources **Students are to research the minerals associated with the California gold rush and put that information together with the history of the gold rush in California. **Students will take the information learned about the gold rush and write a paper on how the economic resources have shaped the history of California. Volcanoes **Demo: Viscosity of water,

warm honey cold honey. **Notes: Viscosity **Students will take notes on volcano explosivity the viscosity. **Students will take notes on the different types of volcanoes around the world. **Students will read the section about volcano in their book and do associated questions from it. **Students will watch videos about the Hawaiian hot spot and the Yellowstone hot spot. Students will compare these hot spots and explain how scientists can figure out plate movements velocities from these areas. **Students will watch explosive non-explosive volcano videos. They will compare the two and determine that the difference is due to the different viscosities their iron silica content. **Students will explain for homework the following: The difference of density of basaltic rock itâ☐™s iron rich nature vs. the granitic rock and itâ☐™s silica rich nature. Students will use their knowledge of types of magma learned during the Bowens Reaction Series unit. **Students will get into groups of 3-4 and research a volcano around the world to present to the class as a PowerPoint presentation. Students will use their book, the internet and other resources to due the project. **Students will use the information the learned from the volcano presentations to study and take a written exam about the different types of volcanoes, the igneous rocks associated with them, and their viscosities. **Students will watch the movie, Danteâ☐™s Peak, and write a 2-3 page paper to explain the tectonic boundary represented in the movie, geologic features associated, type of volcano and type of igneous intrusive extrusive rocks in the movie. Plate Tectonics: **Students will take notes on continental drift seafloor spreading. **Students will do given questions associated with the given notes about seafloor spreading how paleomagnetics work. **Students will do a lab on paleomagnetics. **Students will take notes on the different types of plate boundaries. (Divergent, convergent transform boundaries) **Students will read the section in their book about plate tectonics and do the given questions pertaining to the reading. **Students will learn about the difference in plate densities and how this determines which plate will be subducted and the type of magma that will form. (The elements iron silica determine plate density) **Students will do a lab using their knowledge of the different boundaries, a world map and a plate map to show different geologic features around the world due to plate tectonics. **Students will do a lab showing cross-sections of different locations around the world. Students will be able to use these cross-sections on the written plate tectonics exam. **Students will take a written exam on plate tectonics. Earthquakes **Students will take notes on San Andreas Fault how itâ☐™s a tranform boundary. **Students will look at our local mountains and talk about why they are east-west trending. We talk about why they are there and how they are affected by the San Andreas Fault. We will make a note to come back to this when we get to oil deposition in the Santa Maria area. **Students will watch a three different movies on three different areas around the world that have large earthquakes: 1995 Kobe, Japan Quake; 1985 Mexico City Quake; 1989

Loma Prieta Quake. Students will write a paper explaining the different types of tectonic boundaries associated with each. **Students will watch a video on earthquake preparedness. Students will then put together their own earthquake preparedness plans for their homes. **Students will assess the schoolâ☐™s earthquake preparedness plans. We will do an actual earthquake drill as a class and evacuate the building. We will also assess possible school evacuation problems along with looking through the schoolâ☐™s disaster preparedness supplies. **Students will take notes on earthquakes including key words such as epicenters, hypocenters, focus, and earthquake waves. **Students will read the section in their book about earthquakes and do the given questions pertaining to this reading. **Students will use their book to help them with the given finding the epicenter of an earthquake lab where they will be using triangulation. **Students will use all their knowledge of plate tectonics, volcanoes and earthquakes to do a large project with an earthquake table. Students will draw a scaled floor plan on an earthquake proof building. Students will also build a building for my earthquake table. They need to create a building that could withstand a 7.0 magnitude earthquake given the socioeconomic status of their given area. (Students buy supplies based on the socioeconomics of the area. Poor areas WILL fail!) Faulting Folding **Students will take notes on the different types of faults. **Students will be able to explain the difference between a footwall and a hanging wall. **Students will read about faulting folding in their book. They will answer the given questions pertaining to their reading. **Students will do a faulting lab where they will create 3-dimensional fault block models and answer the given lab questions. **Students will take notes on anticlines synclines along with the geology of oil deposits oil traps. **Students will take notes on the geology of oil deposits in Santa Barbara County. **Students will do a lab about anticlines synclines where they will create 3-dimensional models. They will answer lab questions pertaining to those models. **Students will answer questions pertaining to where oil comes from. They will have to explain the specific events that have occurred in our area (including the bend along the San Andreas Fault) giving way to this economic resource. **Students will take a written exam on earthquakes, faults, folds and oil deposition in our area. Rock Cycle **Review the water cycle. Have students draw the water cycle and the following questions: 1) How does the water cycle work? 2) Where does our water come from in Santa Barbara County. 3) Why is water such a big issue in California? **Students will watch a video about the rock cycle. **Students will take notes on the different environments rocks are deposited in. **Students will do a lab about the rock cycle called the rock cycle roulette. **Students will do a book activity about depositional erosional environments. They will answer the given questions pertaining to these. **Students will look for erosional problems around town as a homework assignment. **Students will do a lab about cave formation and look at how

solutes solvents work to create both primary secondary cave formations. **Students will do a lab about acid rain and itâ☐™s effects on our environment. **Students will take a written and performance exam on rocks the rock cycle. They will look at the given rock clues draw a picture of environments each specific rock formed in. Include what occurred during erosion deposition. Rocks--Igneous **Students will take notes about igneous intrusive extrusive rocks. **Students will do a lab using their books given hand-outs to observe the properties of igneous intrusive extrusive rocks. **Students will do a lab identifying igneous rocks and how they are associated to the Bowens Reaction Series. **Students will identify igneous rocks. Rocksâ☐”Sedimentary **Students will take notes about sedimentary rocks. **Students will read about sedimentary rocks in their textbook do homework based on their reading. **Students will do a lab about sand vs. sandstone. **Students will do a lab using their books given hand-outs to identify sedimentary rocks. Rocksâ☐”Metamorphic **Students will take notes about the different types of metamorphic rocks. They will also learn the difference between a foliated non-foliated metamorphic rocks. **Students will do a lab where they look at the properties of metamorphic rocks. **Students will identify metamorphic rocks. Geologic Laws Unconformities **Students will take notes on geologic laws such as the law of superposition, the law of original horizontality, the law of cross-cutting relations. Students will also take notes on the principle of uniformitarianism unconformities. **Students will read about the laws of geology in their book and do the associated questions. **Students will do a lab on cross-cutting relations and be able to explain when each rock bed was deposited based on their knowledge of the given geologic laws. **Students will create 3-dimensional models showing the different types of unconformities and describe how each unconformity was formed. Historical Geology **Students will learn about the geologic time and take a quiz on the geologic timescale. **Students will watch the video, â☐œWalking with Dinosaursâ☐☐, and write a paper showing why dinosaurs went extinct. **Students will get into a group of 2-3 and research a fossil. They need to draw a picture of the fossil and the environment in lives in. They also need to include whether their fossil was affected by the Paleozoic or Mesozoic mass extinction. Geological Investigation **Students will learn how to read interpret topographic maps. **Students will learn how to create interpret cross-sections from geologic maps.

* Laboratory Activities

Acceptable courses include hands-on scientific activities that are directly related to and support the other classwork, and that involve inquiry, observation, analysis, and write-up. These hands-on activities should account for at least 20% of class time, and should be listed and described in detail. Please itemize and describe the laboratory activities in detail.

Laboratory Objectives Overviews for Advanced Geology Course Topic: Metrics Density Lab: Metric System--Length Lab Overview: This is a hands-on laboratory. Students will use their knowledge of metric conversions to complete the given lab. Students will measure items around the classroom such as a microscope slide, the room, their desks, the walls, the door, etc. Students will take these measurements and practice metric conversions. Lab Objective: This lab will reinforce how to do metric conversions. Science uses the metric system exclusively so itâ☐™s important that this becomes second nature for the students. Lab: How big is our room? Lab Overview: This is a hands-on laboratory. Students will measure the room in meters. They will then use their metric system knowledge to convert the meters into centimeters. Given the lesson on maps and scale given in class, students will take their measurements and create a 1:40 scale model of the classroom. Once this is done, students will take their assigned 1:40 scale dinosaur and answer questions in their lab write-ups that pertain to their data. Lab Objective: This lab will reinforce the idea of scale. Scale is important in geology because geologists use the idea of scale in mapping. This also gives students practice with their metric to metric conversions. Lab: Density Lab Overview: This lab helps students understand the concept of density. Students are to measure different materials such as aluminum bars, aluminum cubes, metal spheres, glass spheres and minerals. Students will find their mass by using a balance. They will then find the volume of the different materials by either using volume equations or by measuring the displacement of water in a graduated cylinder. They will then find the density by using the density equation. Students will finish the lab write-up by answering the conclusion questions. Lab Objective: Density is a concept that is VERY important in geology and in chemistry. In geology, we need to understand the difference in plate densities so we can understand why plates subduct under other plates. Students need a strong understanding of density in order to understand many of upcoming concepts of the class. We will hit upon this concept time and time again throughout the course. Lab: Salinity Reproducible Labs Lab Overview: Students will be given a real life situation to answer in class: â☐œHow could a fisherman fishing in the Gulf of Mexico drink a cup of seawater without having kidney failureâ☐☐. This starts a good conversation about salinity and density. Itâ☐™s a stepping stone to the real lab: Create a reproducible lab write-up that will help a freshmen in my general science class get 4 different colors of water in one piece of straw. That is all the guidance given. Students must use their knowledge of density to solve the problem. First they must solve the problemâ☐”getting all 4 colors in the straw. Then they must complete a detailed lab write-up that can be reproducible. (The freshman general science class grades these labs.) Lab Objective: Any scientist knows the importance of reproducible experiments. If the experiment cannot be reproduced the scientist wonâ☐™t get published and if they canâ☐™t be published they wonâ☐™t get

more funding for future projects. Students by the end of this lab understand this concept very well. They must problem solve based on their basic knowledge of density and then create a really good lab write-up. If the lab cannot be reproduced by anyone else, they get a zero. Topic: Astronomy Unit Lab: Creating a scaled model of the solar system Lab Overview: Students will learn exactly what an astronomical unit is. Given a conversion for these astronomical units, students will create a scaled model of the solar system on a piece of register tape. Students will then complete a lab write-up, which will include questions that will use the scaled distances of the planets. For example, students will have to figure out why the outer planets could retain their original atmospheres where the inner planets could not. Students will see that the inner planets are closer to the sun so when nuclear fusion first took place the primary atmosphere was blown off whereas the outer planets are very far away and therefore werenâ□™t affected by this. Lab Objective: Students will again use the concept of scale. They will also be able to explain why the asteroid belt is located where it is and why the outer planets were able to retain their primary atmospheres while the inner planets could not. Lab: Moon Phases Tidal Affects Lab Overview: Using the notes given in class about the moon, students will create a 2-dimensional diagram showing the phases of the moon. They will also label waxing crescent, waxing gibbous, waning crescent and waning gibbous. Students will show what happens during a spring and neap tide. Lab Objective: Students will complete a diagram of the moon phases. They will explain the difference between a synodic month and a sidereal month. They will also explain the difference between a spring and neap tide. Students will also be able to define â□œmareâ□□. Lab: Eclipses and the Earth Lab Overview: Students will define words such as eclipse, umbra, penumbra, solar eclipse and lunar eclipse. The will create a diagram showing a solar eclipse and a lunar eclipse and they will answer questions pertaining to both types of eclipses in a written lab report such as: What conditions must be present for a solar eclipse? Lunar eclipse? Why man lunar eclipses last several hours compared to a very short solar eclipse? Lab Objective: Students will know the difference between a solar eclipse and a lunar eclipse. They will also be able to define the given vocabulary words. Topic: Chemistry Review Minerals Unit Lab: Overview of Chemistry Lab Overview: Students will do a series of small experiments that will help them review physical and chemical properties of chemistry. These small experiments will help them review ionic and covalent bonding although students will mostly be dealing with ionic bonding concepts during the minerals units. Some of these experiments will include flame tests, saturated vs. unsaturated solutions, making crystals and creating polymers out of alginate from seaweed (kelp ball lab). Lab Objective: The objective of this series of small experiments is to help students review chemistry before getting into ionic bonding and chemical formulas of minerals, crystal structures of minerals and melting points of minerals. Lab: Crystal Structures

Lab Overview: Students will create 3-dimensional crystal structures and compare these to minerals in their rock mineral bins. Students will create a lab write up that will show drawings of these crystal structures and relate them to the chemical and physical properties of the minerals such as melting points, crystal structures, Mohs Hardness Scale, etc. Lab Objective: Students need a good working knowledge of what determines the physical and chemical properties of the minerals. This lab shows students the correlation between crystal structure, ionic bonding and the physical and chemical properties of the different minerals. Lab: Mohs Hardness Scale Cleavage Lab Overview: Given the notes on physical chemical properties of minerals, students will complete the given Mohs Hardness Scale lab. They will also complete the given lab on cleavage in which they will CAREFULLY break apart minerals. Lab Objective: Students will know how to use Mohs Hardness Scale for the upcoming mineral identification lab. Students will also know how to identify whether a mineral has cleavage and thus use this characteristic in identifying minerals. Lab: Mineral Identification Lab Overview: Using the given mineral specimen key, students will identify the minerals in their rock and mineral specimen boxes. Students will write in key characteristics of the minerals such as hardness, cleavage and whether itâ☐™s an igneous rock forming mineral, a sedimentary rock forming mineral or whether itâ☐™s an ore or gangue mineral. Students will also write in the chemical formulas for the minerals and figure out their molecular mass. Lab Objective: Students will learn the important igneous rock forming minerals by sight. They will be able to identify minerals using the concept of cleavage and hardness. They will be using their mineral identification labs on the mineral identification exam. Topic: Igneous Rocks Volcano Unit Lab 17: Bowens Reaction and the Fractionation Process Lab Overview: Students will learn about Bowens Reaction Series and how different rocks will form out of the different elements within the magma. This will be based on what types of minerals are formed at different temperatures within the magma. Students will then get out their igneous rock forming minerals and put them in order of Bowens Reaction Series. They will then create a lab write-up that will explain which minerals will crystallize out of a magma first at the highest temperature and which ones will crystallize out last at the lowest temperature. Students will also explain why an olivine, which is found at the top of Bowens Reaction Series and quartz, which is found at the bottom of Bowens Reactions Series, can never be found in the same rock. Lab Objective: Students will learn about how crystals form out of a magma and how the chemistry of that magma changes over time. As the chemistry of the magma changes (due to the densest material crystallizing out first and falling to the bottom of the magma chamber) different igneous rocks are formed. Lab: Identifying Igneous Rocks Lab Overview: Using the idea of Bowens Reaction Series and Igneous Rocks, students will identify the igneous rocks. They will use their knowledge of minerals to identify these rocks and use their igneous rock

notes to define their texture. From these textures students will be able to tell the cooling history of the rocks. Lab Objective: Students will be able to determine the cooling history of the given igneous rocks. They will also be able to put together the concepts of the fractionation process and Bowens Reaction Series while identifying these rocks. Students will be using their igneous rock identification labs on the igneous rock identification exam. Lab: Viscosityâ□"Water, Warm Honey Cold Honey Lab Overview: Students will use household items to fully understand the concept of viscosity. Students will do a mini-lab using water, warm honey and cold honey to determine viscosity. Students will also be using the concept of viscosity when we get to the oil unit. Lab Objective: Students will be able to show which has more viscosityâ□"water, warm honey or cold honey. Based on this, they will explain how gas bubbles move through the materials. They should come up with the conclusion that cold honey has the highest viscosity therefore the air bubbles they are blowing into it cannot easily escape. This will be used as a springboard into the explosivity of volcanoes. Topic: Plate Tectonics Unit Lab: Paleomagnetics Plate Movements Lab Overview: Given the notes on paleomagnetics and seafloor spreading, students will complete first the given pre-lab on how some iron-bearing minerals line up to magnetic north while in the magma chamber. Students need to understand this concept before they can understand the concept of paleomagnetics and polar wandering. After the pre-lab, students will complete the given paleomagnetics lab and based on their given data, they will figure out the average rate of movement of the North American Plate away from the European Plate. From this, students will figure out how far Africa has split from South America from the time of Pangaea. Lab Objective: Students will use their metric to metric conversions to help them figure out plate velocities. Using real-life data, students will figure out plate velocities and will use this knowledge when looking at the current rates of motions of plates around the world today (such as India crashing into Asia at 5 cm/yr.). Students will also use this as background knowledge during the upcoming physical geography and plate tectonics of the world lab while looking at geologic areas around the world. Lab: Cross-Sections and Plate Boundaries of the World Lab Overview: This lab is a performance exam of sorts. Students will use all their knowledge of igneous rocks, viscosity, explosivity of volcanoes and plate boundaries to create detailed cross-sections of plate boundaries around the world. On their colored plates of the world map, students will note letters such as A-Aâ□™, B-Bâ□™,, C-Câ□™, etc. At these locations, students are to draw a detailed cross-section of the plate boundary. Students will name the plates, color plates according the plate densities, draw and label the types of volcanoes associated with the area and label the types of rocks that would form. Lab Objective: This is a difficult task in which students must use all their geology knowledge and their knowledge of density to create detailed cross-sections. They must also include a key that answers questions

pertaining to their cross-section. Students will be able to use this lab on the upcoming plate tectonics lab. Topic: Earthquakes, Transform Boundaries the San Andreas Fault Lab: Seismic Retrofit â□˜Râ□™Us Lab Overview: Using the concepts learned from the plate tectonics unit and from the previous video laboratory, students will, in the first part of this lab, create a scaled 13,000 square foot floor plan of an earthquake safe building. In this floor plan, they will show evacuation routes/plans, include a key showing what types of special building materials they will need to create this earthquake proof building and what furniture will be in these rooms. (Students will do this on graph paper where 1 square = 4 feet.) Students will also put together a plan view (front view) of the building. The plan view does not need to be to scale. In the second part of this lab, students will actually build an â□œearthquake proof building out of cards, masking tape and straws. The amount of money students will have to buy supplies is based on the socioeconomics of the chosen area. Students will randomly choose these earthquake prone areas from rich areas to poor areas: Los Angeles, California; San Francisco, California; Kobe, Japan; Lima, Peru; Mexico City, Mexico; Papua New Guinea; New Delhi, India. Students must build an earthquake-proof building that can withstand a 7.0 magnitude on the earthquake table. Students must also complete a write-up about the building process and include in this write-up what type of other geologic hazards are associated with their area and what type of tectonic boundary their area is found along. Lab Objective: Students will use the concept of scale again to create their floor plan. They will also use their imagination to plan an earthquake proof building. They must use their mathematics knowledge to figure out the square footage of the building. They draw upon their plate tectonics knowledge as they figure out the geologic hazards associated with their chosen area. Students will actually build their buildings in class. Because some of these buildings will fall down, student grades are based on their participation on their building but mostly on the floor plans plan view. Students will also understand why there is so much destruction associated with moderate earthquakes in third world countries. Lab: Finding the Epicenter of an Earthquake Using Triangulation Lab Overview: Given the notes on earthquakes including definitions of the focus, the epicenter, P waves and S waves, students will use given information to find the earthquake epicenter using triangulation. Students will use data received at a seismic station to determine lag time. They will then plot this data on a graph and find the distance from the epicenter. They will use compasses to find the epicenter. Lab Objective: Students will use compasses to find the epicenter of an earthquake. Students will be able to define lag time. They will also know how a seismograph works. Given the conversations that arise about the seismograph and the Richter Scale, students will be able to explain the difference between the Richter Scale and the Mercalli Scale. Topic: Faulting, Folding Oil Deposition Lab: Itâ□™s Not Your Fault Lab Overview: After taking notes on the different types of

faults, students will create 3-dimensional fault block models. Within this lab, students will create a normal, reverse and a right lateral strike-slip fault. They will create a lab write-up that will include diagrams of faults, type of stress and strain associated with each type of fault and relative movement of the hanging wall and footwall for reverse faults and normal faults. Students will also give examples of where each of these types of faults can be found. (Example: We live along the locked portion of the San Andreas Fault, which is a right lateral strike-slip fault. Due to the stress and strain associated with the locked portion, we see a lot of compression, hence the Transverse Ranges in our area and the local Santa Maria East-West trending mountains.) Lab Objectives: Students will create 3-dimensional fault block models so they can better visualize the movement of the hanging wall and the footwall. They will also be able to answer the homework assignment: Why are the mountains in Santa Maria area trending East-West when the majority of mountains around the world (due to plate tectonics) trend North-South. Students can also observe see what a fault scarp looks like and what can happen to roads, streams, railroads, etc. due to faulting. Lab: Anticlines Synclines Oil Deposition Lab Overview: Students will create 3-dimensional geo-blocks for anticlines and synclines. Within this lab, students will use their knowledge of compressional stress and strain to explain how anticlines and synclines are formed in the lab write up. (Students will have a review of covalent bonding prior to this lab. They will have a lesson on hydrocarbons and their molecular formulas. Within this lesson they will compare the chemical differences between oil coal.) Students will need to include in their lab write up how oil is formed. They must explain the specific events that must occur in oil formation and what specific events occurred in the Santa Maria area to give us oil in our area. (They need to go through the process of accumulation of phytoplankton on the ocean floor through the compression associated from the locked portion of San Andreas Fault giving our specific location oil deposits.) Lab Objective: Students will use their chemistry knowledge to help them understand how oil if formed. They will be able to explain, in detail, the process of oil formation to oil deposition within an anticline and syncline. They will understand a little more of our local historyâ□”we are on the map due to oil production in the area. Students will learn about another economic resource of Californiaâ□”Oil. Topic: Rock Cycle Unit Lab: Rock Cycle Roulette Lab Overview: After taking notes on the different types of rocks and their depositional environments, students will complete this lab. During this lab, students will move around the room at different â□œdepositional stationsâ□□. They will roll a die to find out whether they will stay for 200,000 more years or move to a different depositional environment. At the end of their trek through the rock cycle, students will create a lab write up showing their movement through the rock cycle. They will also answer the questions pertaining to the lab. Lab Objective: Students will be able to see a pattern on their trek through the rock cycle. They

will understand that rocks go through different paths through the rock cycle and that the rock cycle is always on going. Since each roll is worth 200,000 years, they can better understand the time it takes for rocks to change. Lab: Sedimentary Metamorphic Rock Identification Lab Overview: Students will identify the sedimentary metamorphic rocks that are in the rock mineral specimen bins. Students will write down their observations of what each rock looks like and the depositional environment of each. For the metamorphic rocks, students will write down what type of metamorphism occurred for each rock and what the parent rock would be. Lab Objective: Students will be able to pick up a rock and be able to determine whether it is an igneous, metamorphic or sedimentary rock. Students will be able to explain how each rock was formed. Students will know that the state mineral and state rock of California is gold serpentinite. Topic: Geologic Laws Unconformities Lab: Topographic Maps Lab Overview: Students will be able to read a topographic map during this lab. Students will first start with easy topographic maps and then they will get gradually more difficult. Students will look for different types of features on topographic maps such as hills, valleys, cliffs and depressions. Students will use this knowledge to successfully navigate the more difficult maps in order to answer the given lab questions. Lab Objective: The topographic map is a very important tool in geology. Geologists look for different geologic features within the topographic map to help them infer what occurred there geologically. Students will take the knowledge of reading the topographic map one step further in an upcoming lab when they take information from topographic maps and create cross-sections from A-Aâ□™. Lab: Over Under Lab Overview: Students will use their knowledge of topographic maps and create cross-sections from the information given on the topographic map such as strike and dip. By looking at this information, students will be able to â□œinferâ□□ what has happened geologically and will be able to create a detailed geologic cross-section. Based on this cross-section, students will be able to explain what has occurred in the area geologically, for example: anticlines, synclines, normal or reverse faulting. Lab Objective: Students will use all their knowledge of geology learned thus far for this lab. Students will be able to take information from the birds-eye view of the topographic map and create a 2-dimensional cross-section. Students will also explain what types of geologic processes would form these cross-sections. Lab: Cross-Cutting Relations Lab Overview: Students will look at the given cross-sections and determine the relative age of the given rock layers and faults. They will log the ages in a key, at the side of the cross-sections from oldest on the bottom to youngest at the top. Lab Objective: Students will interpret age dating based on their observations of the given rock layers. They will also determine how certain rock structures were formed based on their location in the rock record. For example: Breaks in the rock record are interpreted as an unconformity or a time of erosion which means those rocks

must have been located above sea level at the time. Lab: Unconformities Lab Overview: Students will create 3-dimensional models showing the different type of unconformities: Nonconformities, disconformities and angular unconformities. Students will use their knowledge of the geologic laws to infer what has happened geologically for each type of unconformity. Lab Objective: Students will be able to explain the difference between a nonconformity, disconformity, and angular unconformity. They will be able to explain how each is formed and give an example of where they could find each. Our local geology has angular unconformities and disconformities and students will be able to explain how each was formed in our local area. Lab: Geologic Timescale Lab Overview: Students will create a scaled model of the geologic timescale using register tape. Students will mark the major eras epochs on this timescale. They will draw pictures of important index fossils such as the trilobite and ammonite in the correct time of the timescale. Students will answer questions pertaining to the Paleozoic and Mesozoic mass extinctions. Lab Objective: Students will understand that the majority of geologic time is in the Precambrian. Students will be able to explain that hard parts came about in the Cambrian and this is where much of the fossil record comes into play. Students will be able to explain what happened during the Paleozoic and Mesozoic mass extinctions and how this has affected life on Earth.

* Key Assignments

Detailed descriptions of the Key Assignments including tests, and quizzes. How do assignments incorporate topics? Include all major assignments that students will be required to complete.

Assignment Objectives Overviews for Advanced Geology Course Activity: Collapse! Activity Overview: This is a video activity. Students will watch a segment of a video where a bridge collapses and where a damn breaks. Students will write down their observations of the video. When the video is stopped, they will infer why the collapses occurred. Activity Objective: This lab is meant to teach students the difference between observation and inference. In geology, this is a very important concept. Geologists must infer what occurred geologically based on their observations of an area such as type of rocks, texture of rock, structures within the rock beds (anticlines synclines) and types of fossils found in the rock record. Assignment: Dinosaur Dimensional Analysis Activity Overview: This is a mathematical assignment. Students will read a section on about dinosaurs. (Itâ☐™s real life information about the dinosaurs that were used in the â☐œHow big is our roomâ☐☐ lab.) Given the reading, students will use the given information to perform metric to English conversion problems. To make it more interesting for the students, they will be asked to draw the

environment a certain dinosaur lives in. Students MUST show all their work to get full credit for this lab. Activity Objective: The purpose of this assignment is to have students perform one and two step dimensional analysis problems based on how the dinosaurs would roam the Earth. This not only gives students dimensional analysis practice, it also educates students about dinosaurs. Assignment: Stellar Evolution Comics Lab Overview: Students will take notes on stellar evolutionâ□”the life cycle of stars. Based on this knowledge, students need to create a comic strip, storyboard or play that goes through all phases of stellar evolution. In their lab, students must correctly identify whether a star will become a white dwarf, neutron star or a black hole depending on how much mass the star starts with. Assignment Objective: This assignment is one in which students use the information given to them via notes to show what happens during the life cycle of a star. This is used as a sort of performance exam to see if the students truly understand that mass is the determining factor in which phase a star will go through in life. Assignment: Standards Based Astronomy Project (Major 3 week project!) Assignment Overview: This is a huge research project in which students will be given a topic in astronomy. Specifically, they are given one of the California State Science Standards in astronomy. Students will research this topic based on the guiding questions I have given them. They must then create a PowerPoint presentation based on their topic using the computers I acquired from a grant a few years ago. Students present their topics to the class and from these presentations students ask questions and have conversations based on astronomy. This is an important assignment because it teaches not only how the universe and solar system formed billions of years ago but it incorporates a lot of chemistry concepts in it. From these presentations students have a working knowledge of how the elements were formed on the periodic table, how the chemistry of Earthâ□™s atmosphere has changed over time and how important the process of photosynthesis is. Students will be doing 2 weeks worth of homework assignments to go along with each presentation. Assignment Objective: This assignment ties in how all branches of science are intertwined. While learning about the formation of the universe and the solar system, students gain a working knowledge of how the Earthâ□™s atmosphere has changed over time so life can be sustained on Earth. Students also get valuable experience researching their topics, putting together PowerPoint presentations, and putting together a portfolio that will help them study for the major written astronomy exam. Assignment: Astronomy homework from the textbook Assignment: Written Standards Based Astronomy Exam Study Guide Assignment: History of California the Gold Rush Assignment Overview: Students will watch a video about the gold rush. They will then research the minerals associated with the California gold rush and how the gold was mined. They will research the history of the gold rush. Students will take this information (given to them through student presentations) and write a paper on how economic

resources have shaped the history of California. Assignment Objective: Students will understand that the miners had very little information on how the gold was deposited but they figured out a way to mine it. The placement of this lab is intentionally placed before the plate tectonics unit because students need to understand that the theory of plate tectonics is a recent concept and scientists, miners and geologists didnâ☐™t have knowledge of how the economic resources were emplaced. Students will know the economic resources of California and how they have shaped Californiaâ☐™s history. This will also be a springboard into the upcoming minerals unit. Assignment: Metrics, Astronomy Igneous Rocks Final Exam Study Guide Assignment: Viscosity Explosivity of Volcanoes Assignment Overview: This is a video assignment. Students will first watch a video about the Kalapana, Hawaii (non-explosive volcanoes). In this video, they will take observation notes on the viscosity of the magma. They will note how destructive the lava flow is. They will also note whether they can see the gas bubbles escaping. (One can see them bubble out.) Students will write a conclusion putting all their observations together. They will include the difference between aa and pahoehoe, what temperature the magma would be in the magma chamber based on the type of igneous rocks formed (going back to Bowens Reaction Series) and what texture of rock was observed (aphanetic). They will also learn about the Hawaiian hot spot. They will also learn about different types of magmaâ☐”acidic, intermediate and basic. These will correlate with the different types of igneous rocks they previously learned about. The next day students watch a video about explosive volcanoes. They will take observation notes on the viscosity of the magma. They will note the destruction associated with these types of volcanoes. They will write a conclusion about the types of rocks being formed by this volcano, types of geologic features associated with the area and the destructiveness of lahars and pyroclastic flows. Assignment Objective: The objective of this video assignment is to get students to observe the different types of volcanic eruptions. They will put together that the different types of eruptions have to do with the differences in viscosity. The differences in viscosity have to do with the iron content. High iron content magma has a low viscosity and will produce non-explosive volcanoes. The minerals that are associated with this magma will crystallize out high in the Bowens Reaction Series. Low iron content magma is rich in silica. The silica makes the magma thick and sticky and has a high viscosity. As a result, students will be able to correlate the minerals from our mineral unit with Bowens Reaction Series and the igneous rocks in order to tell the explosivity of the magma. This will help them determine what types of volcanoes will be found in different types of boundaries during the plate tectonics unit. Assignment: Viscosity Quiz Assignment: Danteâ☐™s Peak Assignment Overview: This is another video assignment. Students will watch the movie, Danteâ☐™s Peak. Throughout the movie they will write clues that tell them the mountain will erupt. In the process,

they will learn about the magma source in Mammoth Mountain. (Long Valley Caldera area has forests that are dying due to too much carbon dioxide being emitted in the area. This happens in Danteâ☐™s Peak, too.) They will put all their observations/clues in a paper about the movie. They will include type of volcano Danteâ☐™s Peak, viscosity of magma and volcanic hazards associated with the area and what type of igneous intrusive and extrusive rocks that would be formed. Assignment Objective: Students will put together their knowledge of rocks, minerals volcanics to write a paper about Danteâ☐™s Peak. They will also write about the fictional components of the movie such as the characters out-driving a pyroclastic flow or the low viscosity lava scenes. (The lava associated with this type volcano in real life would be high viscosity.) Assignment: Volcanoes PowerPoint Presentations Assignment Overview: Students will create a PowerPoint Presentation on a volcano around the world. Students will research areas with explosive volcanoes (Yellowstone, Long Valley Caldera, Crater Lake, Mt. Pinatubo, Krakatau) and areas with non-explosive volcanoes (Heimey Iceland, Hawaii). In their research, students will find the eruption history, type of volcano, type of rocks associated with the volcano, and other geologic hazards associated with the area. Students will put together a PowerPoint presentation that will be presented to the class. Students will also create either a 2-dimensional cross-section or a 3-dimensional model of their volcano that is correctly labeled with igneous intrusive and extrusive rocks and the plates that are associated with this volcano. (We have not done plate tectonics at this point so this will be a challenge for students to figure out why the volcano is there.) Assignment Objective: Students will learn specific information pertaining to volcanoes around the world including number of deaths, amount of destruction and types of igneous rocks associated with the area. They will also start thinking about plate tectonics. Best of allâ☐”their cross-sections and models will be donated to a local elementary school so students there can enjoy these and have a visual for their understanding of the earth science standards. Assignment: Physical Geography Plate Tectonics of the World Assignment Overview: Students will take their colored plates of the world map and determine the types of boundaries at specific locations around the world such as the Himalayas, Red Sea, East African Rift Valley, Papua New Guinea, Italy, Aleutian Trench, Indonesia, Andes Mountains, Basin Range Topography, Reelfoot Rift etc. Students will use their knowledge of plate tectonics and plate movements to determine what specific type of plate boundary they are on. Students will then also log in the geologic features associated with the area and whether volcanoes would be found along this area. If there are areas associated with the area, students have to log in what type of viscosity it has (high or low) and whether it would be an explosive or non-explosive volcano associated with it. Assignment Objective: Students are bad at geography so this lab helps them look at the geography of the world while doing geology. Students should start to see a

pattern emerge such as the Ring of Fire where there are volcanoes and earthquakes associated with the area and that there is a tectonic boundary associated with it. Students will also use their knowledge of Bowens Reaction Series again and the viscosity of the magma. Assignment: Comparing Major Earthquakes around the World Assignment Overview: This is a video assignment. Students will watch 3 different videos on earthquakes that have occurred in recent years: The 1989 Loma Prieta Quake, The 1985 Mexico City Quake, and the 1995 Kobe, Japan Quake. Students will take observation notes on each video. They will be required to explain what type of tectonic boundary each area lies on, what types of other geologic hazards are associated with the area (liquefaction, volcanoes, pyroclastic flows, tsunamis, etc.) and how much death and destruction is associated with each. From these notes, students will be required to write a paper comparing the three areas. Assignment Objective: This video assignment gives students the opportunity to see the amount of destruction large earthquakes can produce. This is important for students to see so they can be prepared for the next big earthquake that is expected in Southern Central California. Alsoâ☐”this will give students the background knowledge needed for the upcoming Seismic Retrofit Lab. Assignment: Righetti High Schoolâ☐™s Earthquake Preparedness Creating a Personal Earthquake Preparedness Plan Assignment Overview: Students will look at all the evacuation routes for each block on campus. They will then walk the evacuation route and document possible problems with the routes. For example: Is there handicap accessibility in the route? Is there a high voltage area nearby? Is there a fire hydrant near one of the evacuation routes? Are student evacuation areas between cars in the parking lots? (They are!) Students will then go through the disaster kits located at 4 different areas on campus. Will there be enough supplies for all students during the event of a disaster? From these notes, students will create a write up that will be turned in to safety committee for administration to look over. Students will take this knowledge and create their own earthquake preparedness plan for their homes. Assignment Objective: Students will assess the evacuation plans/routes for the school. This will help the school but it will also help them with their homework assignment: Creating an earthquake evacuation plan for the home. (There is a major threat of earthquakes in Santa Maria due to the San Andreas Fault. We live near the locked portion of the fault so itâ☐™s important for students to understand the threat and know what to do during an earthquake.) Assignment: Students will read about the section on earthquakes in their book and do the given questions pertaining to it. Assignment: Students will read about the section on faulting folding in their book and do the given questions pertaining to it. Assignment: Earthquake, Faulting, Folding Oil Deposition Study Guide Exam Assignment: Students will read about the rock cycle different types of rocks in their book and answer the given questions pertaining to it. Assignment: Depositional

Environmentsâ□”Performance Exam Assignment Overview: Students will pick their assignment out of a bag. Their slip of paper will explain the assignment and give them clues about the different types of rocks that have formed in each scenario. Students will draw and label cross-sections for each depositional environment including what specific type of rock is formed. This is used as a performance exam and is a good review for the upcoming rock identification exam. Assignment Objective: Students will use their knowledge of the rock cycle to show the different depositional environments of rocks. Students will be able to explain what rocks are deposited in certain environments. They will be able to explain what types of rocks are being deposited around the world today. Students will use the geologic law of uniformitarianism, â□œThe present is the key to the pastâ□□. Assignment: Water Cycle Assignment Overview: Students will draw a detailed and labeled cross-section of the water cycle. Students will define key words in a key such as: Run-off, percolation, transpiration, evaporation, condensation, precipitation, ground water, infiltration, etc. Students will answer questions in their lab write up regarding pollution and contamination of the ground water. Students will also include in their write up why water is such a big issue in California. Assignment Objective: This assignment is designed to review phase changes and provides students with basic knowledge of the water cycle. Students will be able to have a conversation/debate in class about water contamination, the LA Aqueduct and other environmental problems associated with the water in our world today. Students will also use their knowledge of the water cycle to understand depositional and erosional environments of the rocks. Assignment: Students will read about geologic laws unconformities in their book and answer questions pertaining to it. Assignment: Quiz on geologic laws unconformities Assignment: Students will read the section on the geologic timescale in their book and answer the questions pertaining to it. Assignment: Quiz on geologic timescale Assignment: Fossil Environments Project Lab Overview: Students will chose a given fossil species to research such as: Tyrannosaurus, ammonite, conodont, mammoth, etc. Students will research what type of environment their fossil lived in, what period of time and why it went extinct. They will also include the classification taxonomy. Students will then create a poster or 3-dimensional model showing the environment the fossil lived in. In a key they will include what it ate, whether it was a herbivore or carnivore, what part of the world it lived in and what climate it lived in. Students will also type up answers to the given lab questions. Lab Objective: Students will create the environment their species lived in based on their research. This reinforces the concept of uniformitarianism. Students will be able to explain why the wooly mammoth went extinct. Students will be able to have a conversation about endangered species in our world today and the politics involved. Assignment: Walking with Dinosaurs Assignment Overview: This is a video assignment in which students will watch part of the Discovery Series,

â□œWalking with Dinosaursâ□□. Students will make observations on the types of environments dinosaurs lived in and what was happening geologically at the time, for example, the break up Pangaea during the Triassic and the volcanically active time in the Cretaceous, before the ultimate demise of the dinosaurs. Students will create a lab write up at the end, answering questions pertaining to parts of the video and the ultimate demise of the dinosaurs. Assignment Objective: Students will be able to see the different climates of the Mesozoic. Students will be able to have a discussion about the mass extinction of the dinosaurs and how this opened a niche for the evolution of mammals. Students will be able to talk further about their thoughts and feelings of species on the endangered species list in the world today. Assignment: Physical Geology Final Exam Study Guide

* Instructional Methods and/or Strategies

**Laboratory Experiences 40% **Project-Based Learning 20% **Lecture Note-taking 20% **Group Work (Including group discussions of real-world problems) 10% **Videos 5% **Library Internet Research 5%

* Assessment Methods and/or Tools

**Laboratory Experiences (Including real-world problem solving) 40% **Written exams (Including performance exams for rock mineral ID) 25% **Classwork (Including standards-based presentations projects) 20% **Quizzes 5% **Homework 10%

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