

PART A: Videos - Watch each video and answer the questions

1. Video #1: [Water- A Polar Molecule](#)

Watch the above video and answer the following questions:

1. Explain the concept of electronegativity and the electronegativity trends on the periodic table.
2. What makes water a polar molecule?
3. Explain hydrogen bonding.
4. Explain the properties of water presented in the video:
 - a. Cohesion
 - b. Capillary action
 - c. High specific heat
 - d. Ice floating
 - e. Good solvent

2. Video #2: [Acids, Bases, and pH](#)

Watch the above video and answer the following questions:

1. Explain how hydronium and hydroxide ions are formed. What is the chemical formula and charge of each ion?
2. How is pH calculated?
3. How is the pH of a substance related to the hydrogen ion concentration? (This is an important concept to be careful with!)
4. Why is understanding pH important in the study of the environment?

3. Video #3: [Environmental Systems](#)

Watch the above video and answer the following questions:

1. Discuss the differences between an open and a closed system, and how this relates to matter and energy.
2. Discuss the 1st and 2nd Laws of Thermodynamics. Why are these important in the study of environmental science?
3. Explain the three energy units discussed in the video.
4. What is systems analysis?
5. Explain the concept of negative and positive feedback loops. (List an example of each presented in the video.)

PART B: UNIT 4 - Please read over the topics, learning objectives, essential knowledge, and enduring understanding for the unit that are found in the table below. I have also included links to several videos that review these topics. Remember we will be having an exam on this topic during the first weeks of school.

Topic	Learning Objective	Essential Knowledge	Enduring Understanding
4.1 - Plate tectonics	Describe the geological changes and events that occur at convergent, divergent, and transform plate boundaries.	● Convergent boundaries can result in the creation of mountains, island arcs, earthquakes, and volcanoes. ● Divergent boundaries can result in sea floor spreading, rift valleys, volcanoes, and earthquakes. ● Transform boundaries can result in earthquakes. ● Maps that show the global distribution of plate boundaries can be used to determine the location of volcanoes, island arcs, earthquakes, hot spots, and faults. ● An earthquake occurs when stress overcomes a locked fault, releasing stored energy.	<i>Earth's systems interact, resulting in a state of balance over time.</i>
4.2 - Soil Formation and Erosion	Describe the characteristics and formation of soil.	● Soils are formed when parent material is weathered, transported, and deposited. ● Soils are generally categorized by horizons based on their composition and organic material. ● Soils can be eroded by winds or water. Protecting soils can protect water quality as soils effectively filter and clean water that	

		moves through them.	
4.3 - Soil Composition and Properties	Describe similarities and differences between properties of different soil types.	• Water holding capacity - the total amount of water soil can hold - varies with different soil types. Water retention contributes to land productivity and fertility of soils. • The particle size and composition of each soil horizon can affect the porosity, permeability, and fertility of the soil. • There are a variety of methods to test the chemical, physical, and biological properties of soil that can aid in a variety of decisions, such as irrigation and fertilizer requirements. • A soil texture triangle is a diagram that allows for the identification and comparison of soil types based on their percentage of clay, silt, and sand.	
4.4 - Earth's Atmosphere	Describe the structure and composition of the Earth's atmosphere.	• The atmosphere is made up of major gases, each with its own relative abundance. • The layers of the atmosphere are based on temperature gradients and include the troposphere, stratosphere, mesosphere, thermosphere, and exosphere.	
4.5 - Global Wind Patterns	Explain how environmental factors can result in atmospheric circulation.	• Global wind patterns primarily result from the most intense solar radiation arriving at the equator, resulting in density	

		differences and the Coriolis effect.	
4.7 - Solar Radiation and Earth's Seasons	Explain how the sun's energy affects the Earth's surface.	● Incoming solar radiation (insolation) is the Earth's main source of energy and is dependent on seasons and latitude. ● The angle of the sun's rays determines the intensity of the solar radiation. Due to the shape of the Earth, the latitude that is directly horizontal to the solar radiation receives the most intensity. ● The highest solar radiation per unit area is received at the equator and decreases toward the poles. ● The solar radiation received at a location on the Earth's surface varies seasonally, with the most radiation received during the location's longest summer day and the least on the shortest winter day. ● The tilt of Earth's axis of rotation causes the Earth's seasons and the number of hours of daylight in a particular location on the Earth's surface.	<i>Most of the Earth's atmospheric processes are driven by input of energy from the sun.</i>
4.8 - Earth's Geography and Climate	Describe how the Earth's geography affects weather and climate.	● Weather and climate are affected not only by the sun's energy but by geologic and geographic factors, such as mountains and ocean temperature. ● A rain shadow is a region of land that has become drier because a higher elevation	

		area blocks precipitation from reaching the land.	
4.9 - El Niño & La Nina	Describe the environmental changes and effects that result from El Nino of La Nina events (El Nino - Southern Oscillation)	• El Nino and La Nina are phenomena associated with changing ocean surface temperatures in the Pacific Ocean. These phenomena can cause global changes to rainfall, wind, and ocean circulation patterns. • El Nino and La Nina are influenced by geological and geographic factors and can affect different locations in different ways.	

Bozeman Videos - watch each video and complete the accompanying packet. There is a digital version of the packet or you can pick one up outside room 100.

- [Geology](#)
- [The Atmosphere](#)
- [Water Resources](#)
- [Soil & Soil Dynamics](#)

PART C: Math Review/Practice - You should be familiar with the math concepts in the table below. Try the practice problems for each concept. If you need a review, I have included links for videos or websites that review that concept. Be sure to show all your work. You can do these problems in a notebook and bring them to class. We will be going over these problems during the first week of class.

Concept	Practice Problem 1	Practice Problem 2	Practice Problem 3
Percentages https://www.youtube.com/watch?v=AL0-0f9azNo	What is 45% of 1800?	A gas engine is 6% efficient. What portion of a 12-gallon tank of gas is wasted?	In a pasture of grass and other plants, the biomass of insects makes up 5000 kilograms. This is 5% of the total biomass of the pasture. What is the biomass of the pasture?
Scientific Notation https://www.mometrix.com/academy/scientific-notation/	Write 550,000,000,000 in scientific notation.	$(2.96 \times 10^7) + (1.0 \times 10^7)$	$(6.0 \times 10^6) / (3.0 \times 10^4)$
Percent Change https://www.youtube.com/watch?v=jAcDJDjQk2g	If cyanide in a stream next to a gold mine increases from 240 ppm to 360 ppm, what percent increase is this?	A toxin increases from 12 ppm to 48 ppm. What percent increase is this?	The atmospheric concentration of carbon dioxide increased from 278 ppm in 1790 to 383 ppm in 2007. What is the approximate percent increase in carbon dioxide concentration from 1790 to 2007?
Metric System Conversions https://www.youtube.com/watch?v=kOJFS	Convert 1200 watts to kilowatts (kw).	Convert 60 grams to milligrams.	Convert 500 kilometers (km) to meters.

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Half-Life Problems https://www.youtube.com/watch?v=WAsmY4ocWSA	A 50 gram sample of radioactive Iodine-131 has a half-life of 8 days. After 32 days, how much is left?	A 48 gram sample of Germanium-66 is left undisturbed for 10 hours. At the end of that period, only 3 grams remain. What is the half-life of this material?	A sample of radioactive waste has a half-life of 10 years and an activity level of 2 curies. After how many years will the activity level of this sample be 0.25 curie?
Word Problems using Dimensional Analysis https://www.youtube.com/watch?v=cbPmLTle4A4	Americans recycle about 35% of their solid waste (trash). If an average American generates about 2 kg of waste every day, how much of that waste is recycled per year?	A family of five recently replaced its 5-gallon-per-minute showerheads with 2-gallon-per-minute showerheads. Each member of the family averages 8 minutes in the shower per day. How many gallons did each person use each day with the old showerhead? How many gallons will each person use each day with the new showerhead? How many gallons will the entire family save per day?	Burning one gallon of gasoline in a car releases approximately 20 pounds of CO₂ into the atmosphere. One person drives 50,000 miles in a hybrid car that averages 50 miles per gallon (mpg), while another person drives 50,000 miles in an SUV that averages 20 mpg. Over the course of the 50,000 miles, how many fewer pounds of CO₂ are released by the 50 mpg car than by the 20 mpg vehicle?