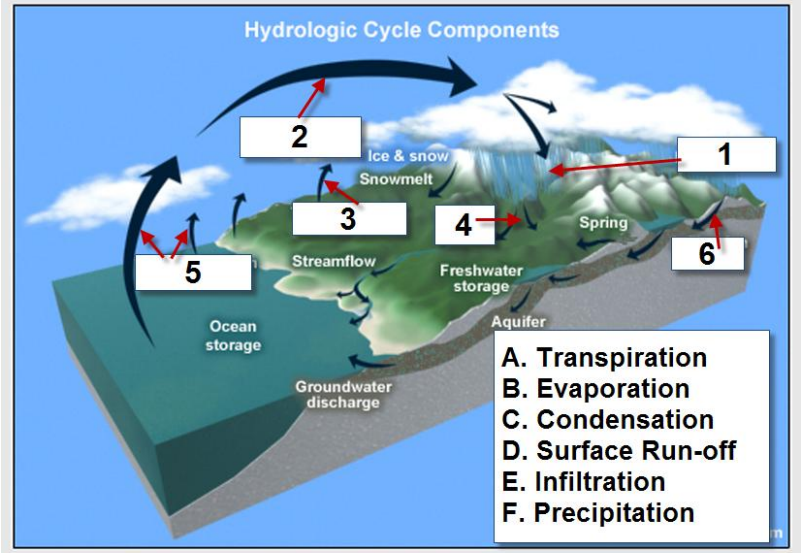
Honors Second Semester Study Guide:

Remember that this is a final (end of course exam) and about 20% of the questions will be from the first semester. So let's think about what was most important from the first half of the year. Two things come to mind right away:

1. The water cycle --- think about how that is related to weather and climate, areas that we are studying now.
2. Plate tectonics --- earthquakes happening daily around the world are a constant reminder of the importance of this area.

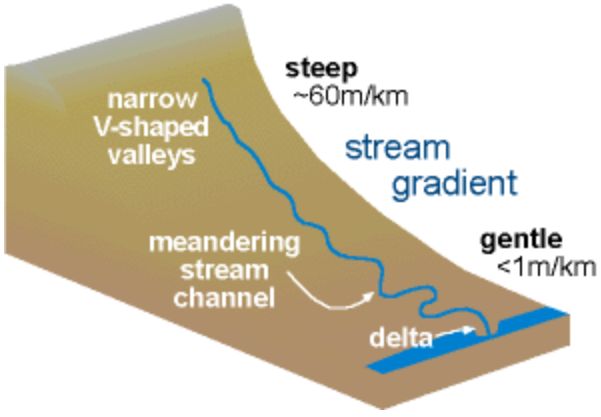
The water cycle: precipitation, runoff, infiltration, accumulation, evaporation, condensation, and all the rest that goes with it. Remember how we have an excess of evaporation over the oceans and an excess of precipitation over the land, returning to the oceans in runoff (rivers) and infiltration through the ground (ground water area of saturation) and of course also as precipitation.



This diagram shows the critical components of the Hydrologic Cycle.

Also included in our study of the water cycle were **rivers and streams**. Since we have an excess of precipitation over the continents this water seeks the lowest level due to gravity, flowing from higher elevations through tributaries to rivers to the oceans and also infiltrating the ground forming the major storage (accumulation area) of fresh water for human use.

In rivers we looked at the effects of stream gradient (slope, change in elevation divided by distance) on the shape of rivers (velocity, channel width and depth). River slope decreases as you travel from head waters towards the mouth while discharge increases (more water). The width and depth also increase.



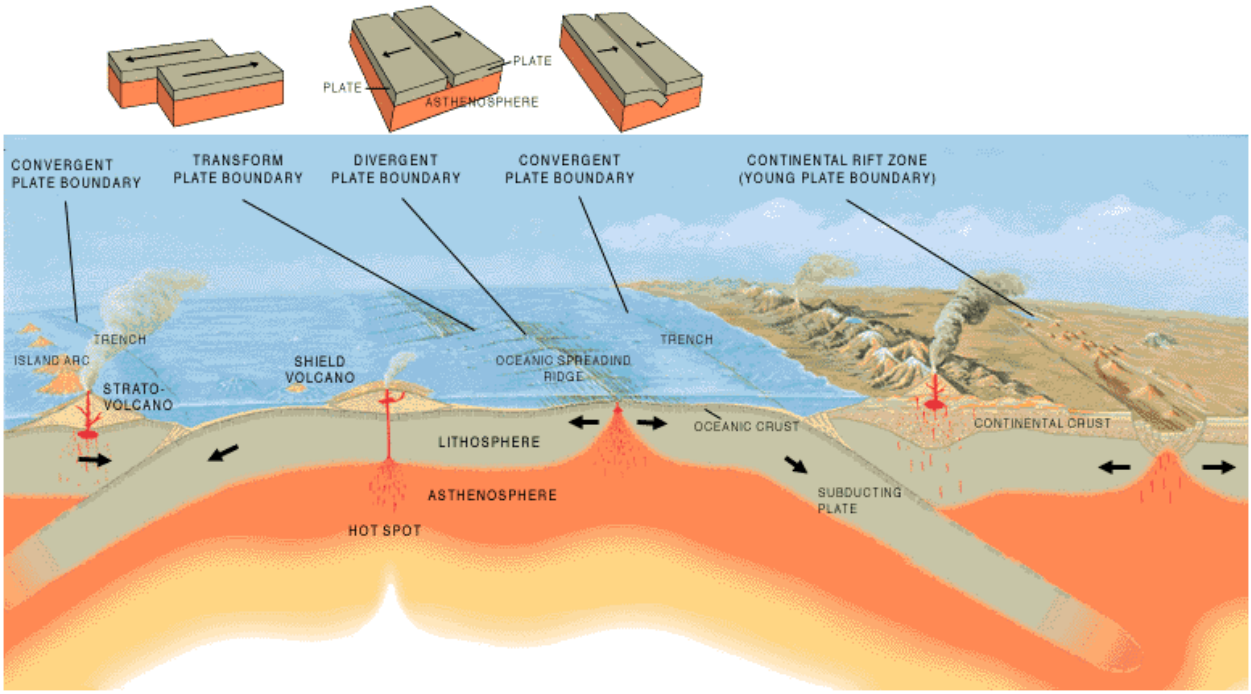
Near the mouth stream channels meander and form large flood plains. Major floods in these areas are often caused by rapid spring snow melts in higher elevations, while in Florida flooding is more often caused by severe storms. Levees are frequently built to protect areas from flooding but sometimes fail as in Katrina.

Streams are a major force in erosion of land carrying material along in solution, suspension and scooting along the bottom. Decreasing the base level (lowest point of the stream bed) would increase the potential and kinetic energy thereby increasing the amount of erosion. The force of moving water tends to cause stream rocks to tumble and become smaller and more rounded or spherical (go to Lowes and look at river rock). When a

streams velocity decreases its ability to carry materials in decreases and deposition occurs (larger, heavier pieces will settle out first). Deposition at the mouth of a stream sometimes results in the formation of deltas.

Within the water cycle we also discussed the importance of ocean circulation in the transport of heat from the low latitudes to the higher latitudes; for example the Gulf Current warms Europe (the other method of heat transport being atmospheric circulation). Ocean currents are driven by wind and density (colder water is denser than warmer and saltier water is denser than less salty water).

Plate Tectonics: Three major types of plate boundaries: convergent (moving together -- Himalayan Mountains), divergent (moving apart -- mid-ocean ridges) and transform (moving side by side – San Andres fault). Plate boundaries can also be related to formation or destruction of crust (divergent – seafloor spreading – creates oceanic crust, while subduction zones in convergent boundaries destroy crust). Volcanoes can form along both convergent and divergent boundaries.

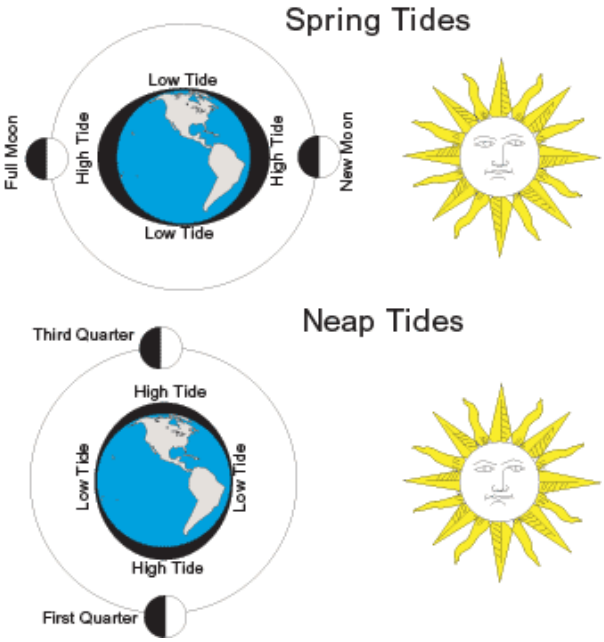


Earthquakes most often occur along plate boundaries (ring of fire) and create waves that travel through the Earth. P waves – primary, arrive first, push/pull (longitudinal); S waves – secondary, arrive second, side to side (transverse), do not travel through liquid outer core; Surface waves --- travel only along the surface, cause the most damage.

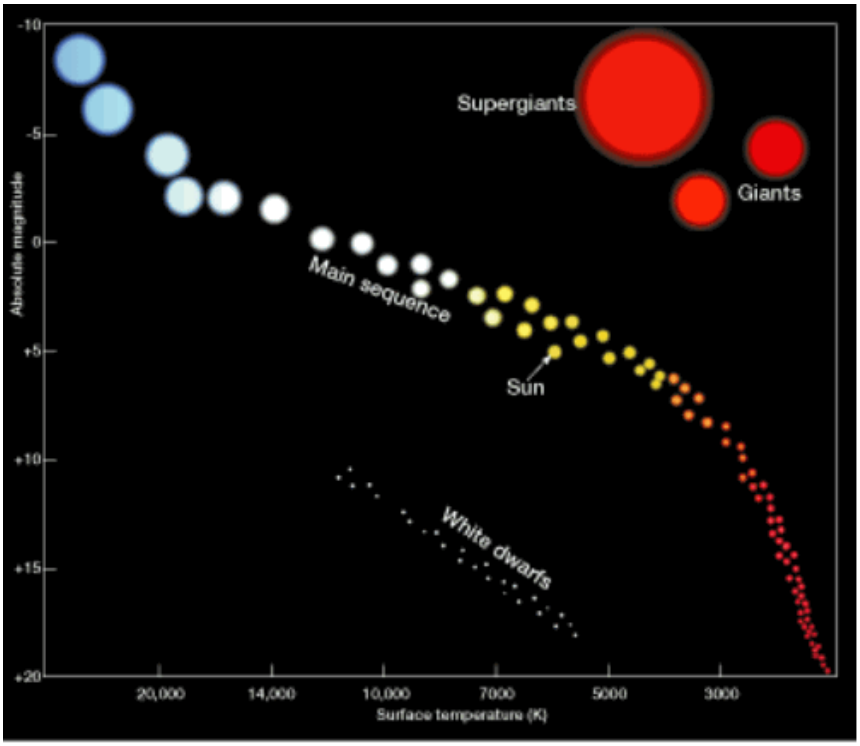
The first semester ended in the middle of our astronomy section, so we'll pick up where that one left off, but you might want to go back to the first semester study guide and read through the astronomy section there as well.

ASTRONOMY: Start with the beginning --- the big bang – the theory of the formation of the universe some 14 billion years ago. As our knowledge of the solar system developed theories about its organization changed from a geocentric view (Earth at the center) to Heliocentric (sun at center). We know that the universe is filled with billions of galaxies each with billions of stars. Our Milky Way galaxy is a spiral shaped galaxy, others have different shapes. However space, like all matter, is made up of mainly empty space.

Review the Earth – Sun – Moon relationships. Know the positions for eclipses and phases of the moon and review spring and neap tides. The reason for the season is Earth's axial tilt which results in different amounts of energy reaching the Earth's surface.



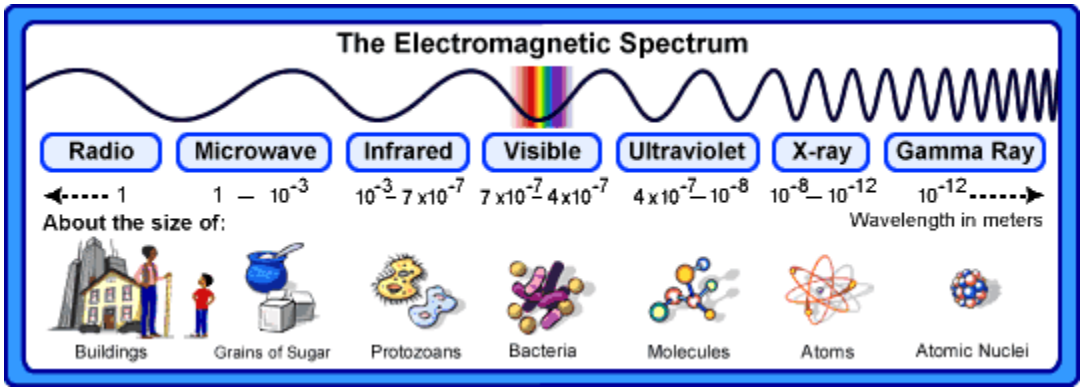
Our sun is an average main sequence star with an absolute magnitude of about +5 and is located near the middle of the HR Diagram. As our star ages and uses up its hydrogen fuel it will become a red giant (it will not become a super nova only very massive stars, the ones at the top left, do that. Also more massive stars have shorter lives). Remember as you look at the HR Diagram that it shows the relationship between temperature and brightness (absolute magnitude or luminosity). You should know the difference between absolute and apparent magnitude. Color also tells us about the temperature of stars.



Dennis Tasa

Know the electromagnetic spectrum, understand that as you increase wavelength you decrease the energy of the waves and the frequency. High energy, high frequency waves have short wave lengths and are the most dangerous. Also recognize that these waves are around us all the time but we can't observe them because their wave lengths are

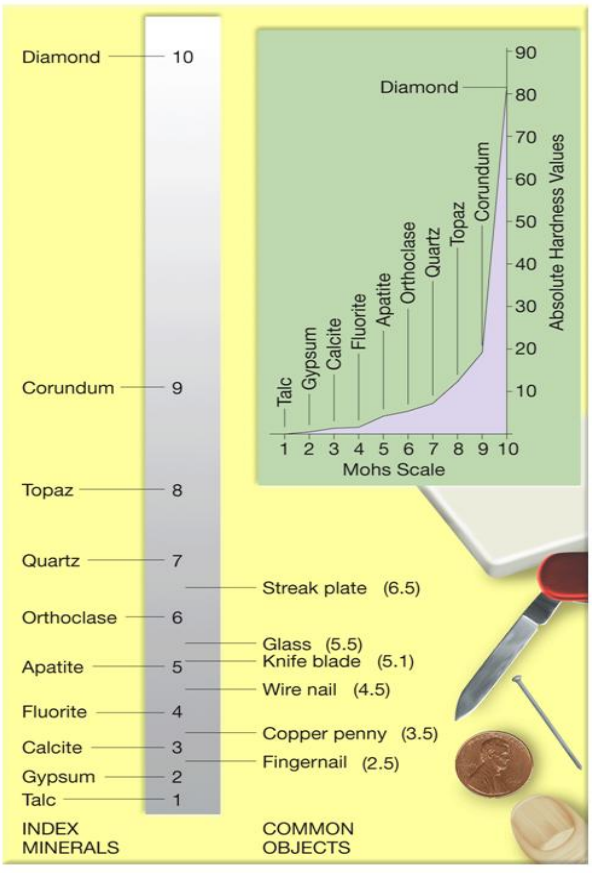
either too short or too long (we can only see visible light). We use many different wave lengths to study the stars.



ROCKS AND MINERALS

Rocks are made of minerals and mineral like substances. Minerals are naturally occurring solids with a orderly crystalline structure and a definite chemical composition. Minerals form through crystallization in magma, precipitation from solution, under pressure and heat, and in hydrothermal solutions. Minerals are classified by their composition: silicates, carbonates, oxide, sulfates, halides and native elements.

Minerals have specific properties. Streak; while samples of the same mineral may have different colors to the naked eye when rubbed on a scratch plate the powder residue has a specific color. Luster refers to how light reflects from the surface. Crystal form refers to the shape of the crystals. Fracture or cleavage refers to how a mineral will break. Hardness is a mineral's resistance to scratching, usually measured on the Mohs scale which rates hardness to common objects such as glass, a wire nail, or your fingernails. Density is the ratio of mass to volume.



Rocks are naturally formed solid mass of minerals or mineral like substances, and often are comprised of more than 1 mineral. Focus on rock cycle not individual rocks. Any rock can become any other rock. The rock cycle is powered by both the energy from the sun and the Earth's interior. The sun is the energy source for weathering, the first step in the formation of sedimentary rock (weathering, compaction and cementing). The Earth's

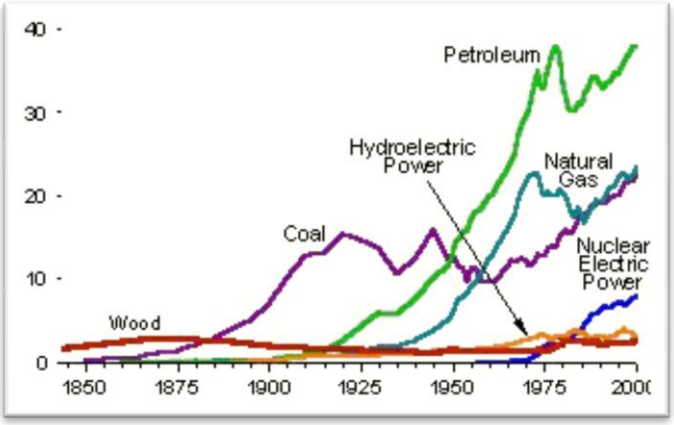
interior heat and pressure form metamorphic rocks, while melting & hardening form igneous rocks: intrusive hardened inside, extrusive hardened outside).

Know the different between mechanical/physical weathering and chemical weathering. Frost wedging is a form of mechanical weathering powered by the sun (repeated freezing and thawing of water in rocks causes them to crack).

Fossils form only in sedimentary rocks. Fossils and rocks provide a visual history of Earth. Lower layers of undisturbed rocks formed further back into the past than layers nearer to the surface; this is known as superposition.

Energy Resources:

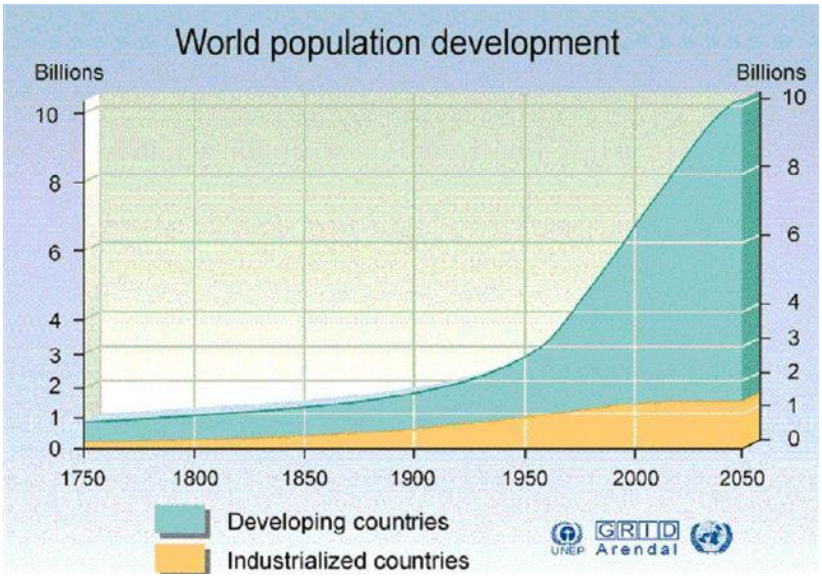
Know the difference between renewable and non-renewable resources. Fossil fuels (non-renewable): petroleum formed from plants (algae) under the oceans; coal formed from plants in lowland swamps. Nuclear energy is also non-renewable.



Renewable resources: hydroelectric (falling water), geothermal, wind, solar, tidal, and biomass.

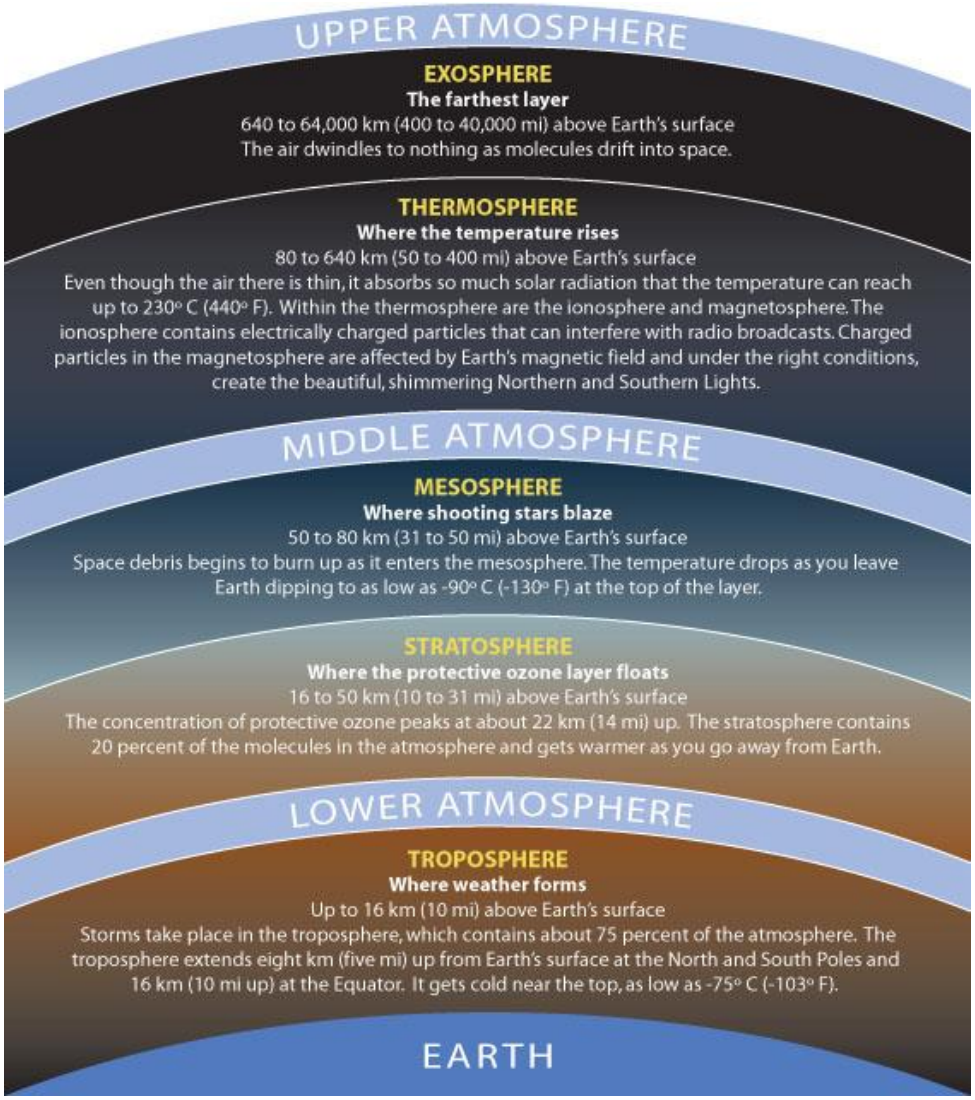
The main source of electrical energy in Fl is natural gas.

Population growth is a major source of concern for the Earth's natural resources. Increased population and expanding middle class in high population countries like China and India will place greater demands for resources of all kinds (water, minerals, energy). Already scarce supplies of fresh water will be stressed even more. Increased mining can lead to greater erosion and water pollution. New demands for electricity mean greater use of fossil fuels leading to increased pollutants such as nitrogen oxides and sulfur oxides which form acid rain (nitric acid and sulfuric acid).



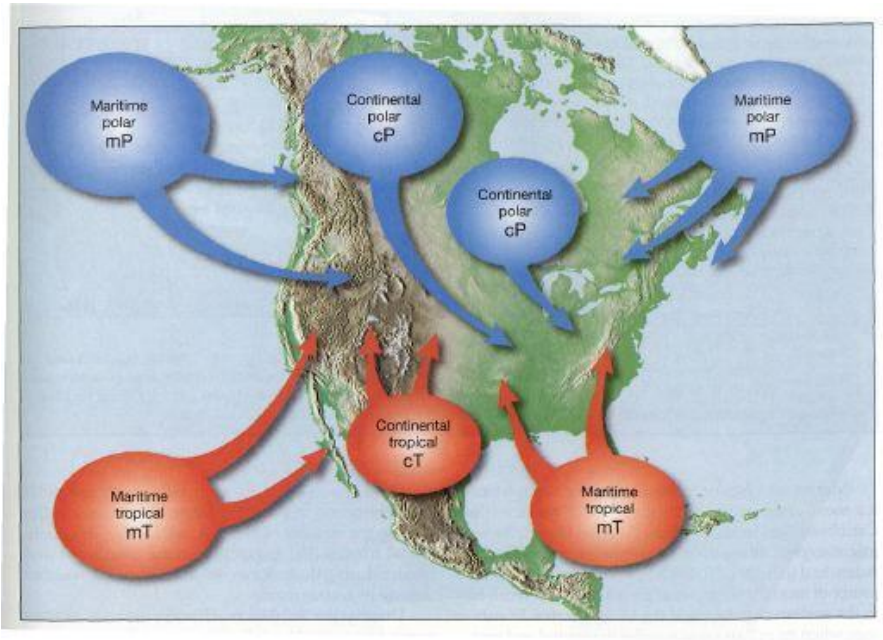
Weather:

Our weather takes place in the layer of the atmosphere called the troposphere. As air rises in the troposphere it expands and cools. Atmospheric circulation in the troposphere moves heat energy around the globe. Major heat transport mechanisms are convection and radiation.



Uneven heating causes differences in temperature which leads to differences in pressure that result in wind. Winds around a high pressure system in the Northern Hemisphere travel clockwise and away from the high. Winds around a low travel counterclockwise and towards the low.

High pressure systems lead to stable air and typically clear weather, while low pressure systems lead to unstable air and cloudy skies.

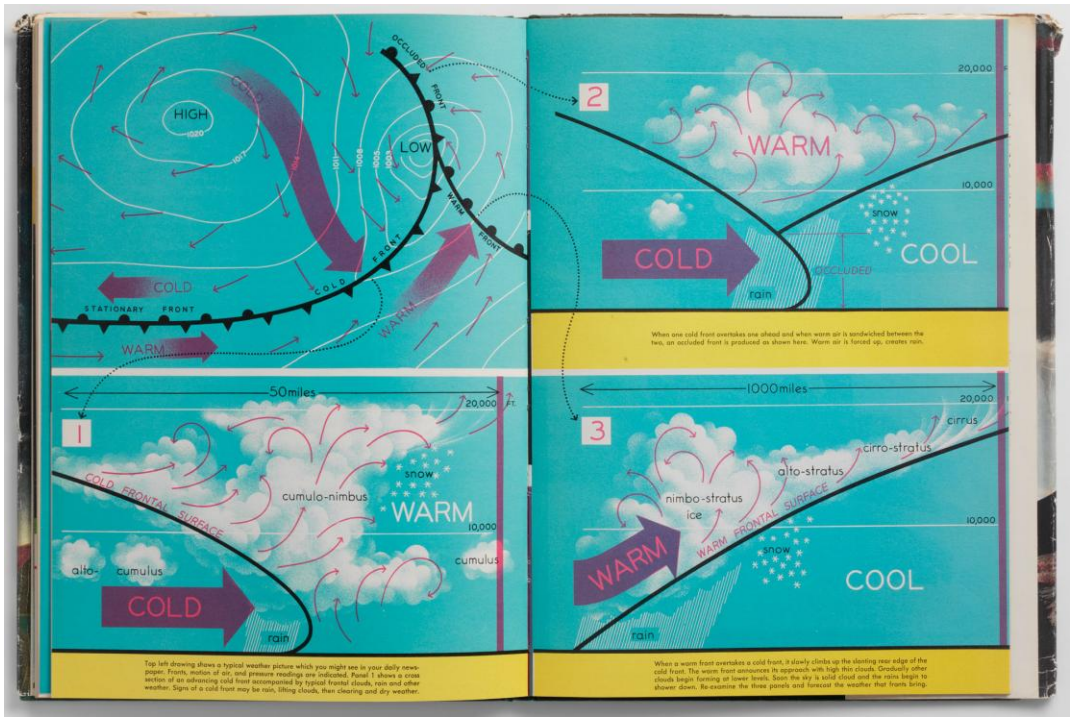


Weather systems move across the US from west to east driven by the prevailing westerlies and the jet stream.

Be sure to review land/sea and mountain/valley breezes.

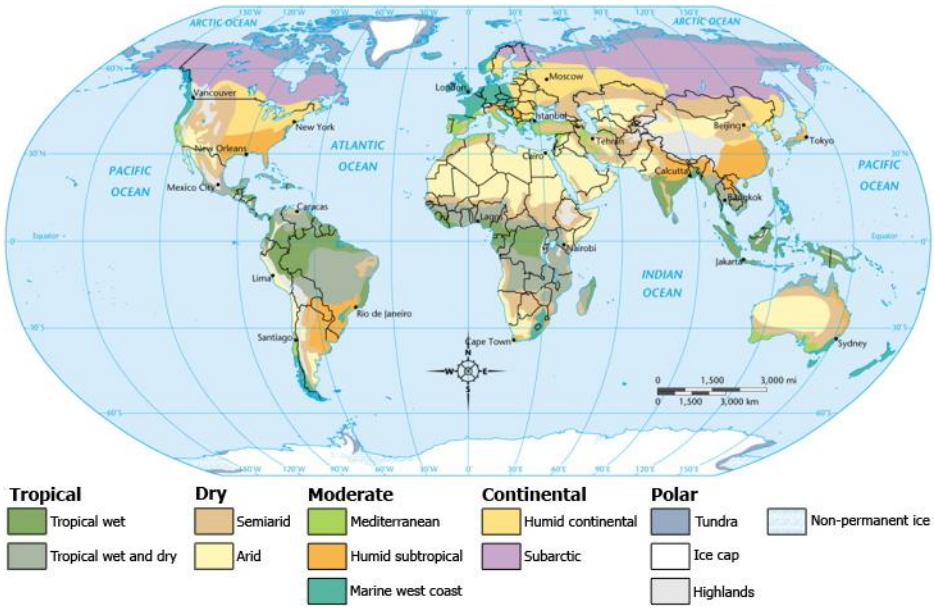
Air masses are immense bodies of air with similar temperature and moisture. Most of the weather in North America, especially east of the

Rockies, is dominated by continental polar and maritime tropical air masses. The boundary between 2 different air masses is called a front. Certain weather patterns are often associated with specific front types.

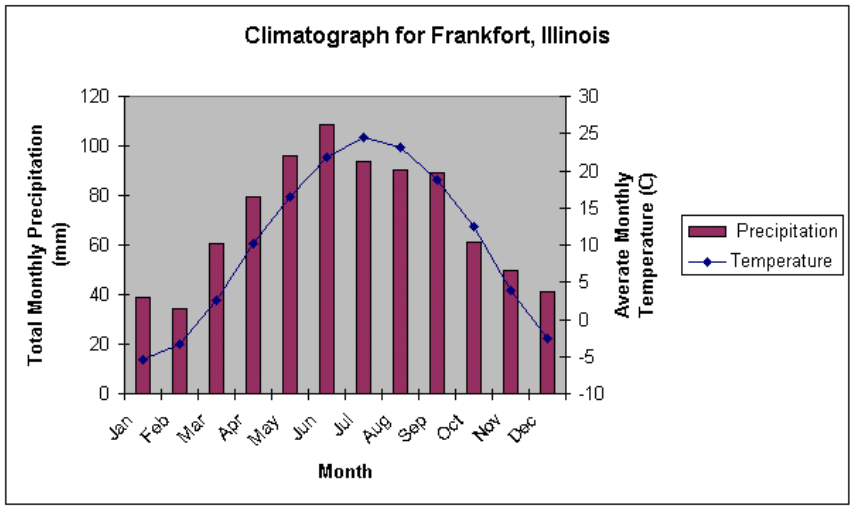


Climate:

Climate is the general prevailing weather conditions of an area over a long period of time. It is usually expressed in terms of temperature and precipitation. The climate in any area is affected by a number of factors including latitude (lower warmer, higher cooler), proximity to bodies of water (water moderates climate, not as hot not as cold), elevation (higher cooler), and windward (wetter) or leeward (dryer) sides of a mountain.



Natural cycles modify climates on earth; the orbit of Earth, its axial tilt and the activity on the sun create cyclical changes to Earth's climate including ice ages. Plate tectonics can change the climate on specific land masses by changing their positions over very long periods of time.



Climates can be presented on a graph showing months of the year on the x axis and average temperatures and precipitation on the y axis.

Evidence of global warming include: actual temperature readings showing increased temperatures, comparisons to paleoclimates (old climates) and to predicted current average global temperatures. The major greenhouse gasses (atmospheric gasses which absorb and emit heat energy causing the atmosphere to become warmer) are H_2O water vapor, CH_4 methane gas, and CO_2 carbon dioxide. CO_2 enters the atmosphere through respiration, combustion, burning fossil fuels, weathering of rocks, decay and volcanism. Carbon footprint refers to all the activities of an individual that add additional carbon to the atmosphere. Human activities have caused a significant increase in the amount of CO_2 in the atmosphere within the past 50yrs.

A couple of last points:
Understand conduction (touching), radiation (can travel though vacuum of space) and convection (mass movement of a fluid). Remember that some objects are better conductors of heat and may feel cooler (the desk in class and your textbook are the same temperature but the desk feels cooler).

There will also be general "nature of science" questions which focus on valid experimentation and the scientific method.

This is just an overview guide of areas I think to be likely focus of questions. It is not designed to teach you everything you need to know. I hope you've learned something along the way and this will serve to stimulate your memory.