**4th Hr. Earth Science Exam Review – Concept List**

**Plate Tectonics (EQ /Vol) / Atmosphere (Weather/Climate) / Earth History (Fossils and Evolution) / Human Impacts / Space**

* Evolution is the change in a gene pool over time.
	+ Microevolution – generational change in a gene pool over time.
		- Natural selection – survival of the most fit. Examples of NS would be Darwin’s finches and Kettelwells Moth’s, Dodge ball
	+ Macroevolution – evolution over a long period of time, where new species develop
		- Speciation – the process of creating a new species
* Individuals adapt and populations of species evolve.
* The plate tectonic theory began as a hypothesis known as continental drift.
	+ Seafloor spreading was the mechanism for continental drift, we see that the seafloor spreads at the mid-ocean ridges
	+ Plate boundaries – found at the edge of lithospheric plates
		- Convergent - Compressional Forces push plate together – we see mountain ranges, volcanoes, large earth quakes, deep sea trenches, have reverse faults
		- Divergent – tensional forces pull plate apart – rift valleys, volcanoes, ridges, normal faults
		- Transform – shear forces cause plates to slide by each other, major Earthquakes, Strike –slip faults
* Earthquakes occur do to massive releases of energy, the mechanism that causes earthquakes is called elastic rebound.
	+ Elastic Limit – how far a rock can stretch before it breaks.
	+ Earthquakes can be measured using two different scales: The Richter (based on release of energy) and the Modified Mercalli Scale (based on the amount of damage observed).
	+ EQ release energy via seismic waves: p-waves, s-waves, and surface waves
		- P-waves – longitudinal waves (back and forth)
		- S-waves – transverse waves (up and down) – don’t travel through liquid, that is how we know the Earth has a liquid core.
		- Surface waves – create the damage
	+ Difference between epicenter and focus – epicenter = at the surface above the focus. Focus is the actual point of energy release (underground)
* Volcanoes – are formed at plate boundaries or hot spots (weak points in Earth’s crust).
	+ Three main types: Shield, Cinder cone, and Composite
	+ Volcanoes anatomy: conduit (the volcanic magma pipes), vents (where the lava/tephra comes out), crater, caldera, magma chamber, fissures, etc.
	+ Igneous rock intrusions: batholith,
	+ Volcanic Eruptions are based on amount of trapped gases and silica content
		- More silica = more gases = more explosive
		- Categories from weakest to largest: Hawaiian, Strombolian, Vulcanean, Pelean
* Evidence for plate tectonics includes
	+ Continental fit – continents look like they fit together.
* Geological time is based on the life forms found in the rock strata.
	+ GTS breaks down into Eon, Era, Periods, Epochs
	+ Eons – [Hadean, Archean, Proterozoic] 🡨 Precambrian Time, Phanerozoic
	+ Eras – Protozoic (jawless fish) , Mesozoic (Dinosaurs) , Cenozoic (Mammals)
	+ Periods – Index Fossils
	+ Epochs – Major events in Earth History (ice age, meteorites, etc.)
* Rock strata (layers) can be dated two ways:
	+ Relative: Six laws of RD are used to determine which layers are the oldest
		- Crosscutting / Original Horizontality / inclusions / Superposition
	+ Absolute: try to find the actual age of rock through radioisotopes
		- C-14 – has a limit of 50,000 years
		- Organism have a constant amount of C-14 in them until they die, then it decays at a steady rate
			* Rates are measured in half-lives – time it takes for ½ of the original C-14 sample to decay
* Fossils are created when hard parts of organisms are covered and protected from scavengers and the elements
	+ Index fossils
	+ Trace - things like footprints, burrows, wormholes, things like that.
	+ Original remains – parts of the organism that survived (hair, fur, skin)
	+ Molds and casts – mold = cavity, cast = the minerals that fill the mold and create replica of the original organism
	+ Permineralized – are made when the minerals in the soil fill spaces in the bone, the bone decays and leaves the minerals in the shape of the original bone.
* The Earth’s atmosphere is made up of nitrogen and oxygen mostly and is divided up into layers
	+ Layers of Atmosphere have distinct properties
		- Troposphere – where weather happens and clods are,
		- Stratosphere – has the ozone layer (protects form UV rays and hurt by CFC’s)
		- Mesosphere – very little particles so it’s really cold
		- Thermosphere – contains the ionosphere (radiowaves & Aurora Borealis), very hot
		- Exosphere – transition into outer space
	+ Earth’s atmosphere is thought have originated from volcanic outgassing of water vapor. Oxygen is separated from the water molecule by photochemical dissociation (break up of molecules by UV light)
	+ Air mass that are found in the atmosphere: cT, mT, cP, mP. These air mass posse distinct characteristics like temperature and humidity.
		- Fronts are the edge of the air mass
			* Occluded – when the cold front chases the warm from, warm air is pushed upward. May have a quick Storm followed by heavy rain.
			* Stationary – warm and cold air masses are moving parallel to each other, neither front advances. Longer periods of rain, drizzle. No storms.
			* Cold – severe weather is associated with these fronts, we would see cumulonimbus and cumulus clouds.
			* Warm – tend to see more stratus clouds, produces steady precipitation.
	+ The jet stream is a narrow belt of air in the atmosphere, pulls cold air down from the north and brings up warm air from the south. Fluctuation in the jet stream cause fluctuation in the weather (Michigan weather.)
	+ 4 major wind patterns we see in the atmosphere are: Polar easterlies, prevailing westerlies, tradewinds, and the doldrums (really the lack of wind)
* **Human population growth can be describe in four stages:**
	+ Pre-Industrial – low population growth due to high birth and death rates. Agrarian society, large families, kids work to support farm. Poor social conditions.
	+ Transitional – high birth rates, lowering death rates, due to better health care, education, food production, etc.
	+ Industrial – low death rates, lowering birth rates due to parents working and kids not working on farms, kids are a burden so parents are have less.
	+ Post-Industrial – low death and birth rates, population stabilizes. No or negative growth.
* Hazardous waste is considered hazardous if it explodes, poisonous, flammable, carcinogenic.
	+ Ways of dealing with waste include: use of enzymes (break down hazardous waste), phytoremediation (plants uptake waste from soil), sanitary landfills (have liners and vents for outgassing)
* Major types of pollution includes point source and nonpoint source.
	+ Point source – pollution that is put into the river, area, etc that comes from one location (ex: factory running a pipe to a river to dispose of waste), can be controlled
	+ Non-Point source – pollution that is spread over larger areas (ex: fertilizers, acid rain, manure from fields or pastures)
* There are several types of energy used by humans to “power life: solar, hydroelectric, geothermal, biofuels, wind, nuclear, biomass.
	+ Biomass (wood, feces, ect.) fuels can be further process into biofuels (like ethanol).
* Galaxies are large clusters of stars. The Milky Way galaxy is a spiral and it has a large black hole at its center. The other types of galaxies are elliptical and irregular.
* Venus is the hottest planet due to an CO2 atmosphere that creates an extreme greenhouse effect.
* The sun is a main sequence star and is very average star in terms of its brightness and luminosity
* Other objects in our solar system include:
	+ Dwarf planets 🡪 Pluto is not a planet
	+ Comets – originate in the oort cloud and revolve around the sun. Their tails always point away from the sun. Parts of a comet: coma, nucleus, plasma/ion tail, dust tail.
	+ Asteroids – very large “potato” shaped rocks that move through space (located mostly in the asteroid belt – between mars and Jupiter), large enough to have moons
	+ Meteoroids – fragments of asteroids, float through space, when capture by Earth’s gravity and enter atmosphere they become a meteor. When they hit the Earth’s surface they become a meteorite.
* Red shift occurs when an object emitting light is moving away from Earth, the light stretches (wavelength gets longer) and the light that reaches earth becomes more red. Blue shift the object emitting light is approaching Earth.
	+ Red shift is evidence of an expanding universe as explained by the big bang theory
* Neptune and Uranus are the Ice Giants. They are both blue due to crystallized methane in their atmosphere.
* Parallax is an apparent change in distance between two objects dues to a change in the observer’s perspective.