ESCI 121 Hemzacek Spring 2010 ***FINAL VERSION*** **REVIEW LIST FOR FINAL EXAM**

Current Material: streams and flooding; weather and climate (half of total points for exam)
remember that, in addition to this review list, homework questions for current material are always fair game!

Be able to explain the concept of **base level**, and how ***local*** *or* ***ultimate base level*** affects work done
–> Since meandering streams generally develop on low gradient areas, and close to base level, how did the Colorado River manage to down-cut through almost a mile of rock?
Be able to discuss stream processes, specifically the interaction between:
gradient and *channel size* on *velocity*, *erosion*, *deposition*, and *size of sediment transported*;
you should be able to describe (and use *simple* diagrams to illustrate) how ***channel shape*** of a **meandering stream** affects distribution of stream ***velocity***, and therefore patterns of ***deposition*** and ***erosion*** in the channel
Be able to distinguish **competence** and **capacity**; and connect to the effect(s) of **velocity** or **discharge**
Be able to describe interactions of the following factors, affecting erosion/transportation/deposition in streams:
velocity **discharge** **gradient** **channel size**
Be able to describe the relationship of the following concepts to **flooding** and flow of streams:
divide / drainage basin/ watershed **flood plain** **levee (natural vs. artificial)**
recurrence interval **meandering stream** **braided stream**
Be able to explain the meaning of *floodplain designation by recurrence interval* ("100-year flood / flood plain")

Be able to describe the significance of flood plain designations, such as "*100-year floodplain*":
what does this term *mean*? how does building /development in an area affect the potential for flooding?
Be able to describe and discuss factors that contribute to flooding: discharge (due to?), geology (ground material), topography

Be able to describe the significance of each of the following concepts:

weather** vs. **climate	***relative humidity***	***dew point***
barometric pressure	***isobar***	***air mass***
Coriolis effect	***adiabatic cooling***	
greenhouse effect	***stability (of an air parcel)***	

Relative to processes of the water cycle (**evaporation** /**condensation** /**precipitation**), be able to describe the process of *cloud formation* due to air movement, pressure changes, and ***adiabatic cooling***
Be able to describe various mechanisms of **air lifting** that contribute to cloud formation:
local convection (warm air rising); *surface convergence* (**low P system**),
physical barrier (mountains), *frontal lifting* (warm/cold front)
Be able to contrast the characteristics of main types of clouds, as classified on the basis of *height* and *form*:
cirrus, cumulus, stratus; also ***nimbostratus, cumulonimbus***
Be able to associate each of these different cloud types with the *type of weather conditions* generally represented
What is the difference between cumulus and cumulonimbus clouds?

Be able to describe the causes of *wind direction* and *speed*, including the effects of: ***barometric pressure***, ***pressure gradient***, and ***Coriolis effect***:
Be able to sketch a pattern of *air movement* relative to a high- or low- pressure center in the *northern hemisphere*.... what is the convention for reporting **wind direction**?
Be able to describe the significance of **air masses** with respect to weather and climate; be able to describe the significance of *symbols* used to designate air masses (e.g., cP, mT) ***(–> what characteristics define a particular air mass?)***
Be able to briefly discuss several factors contributing to understanding weather and weather forecasts;
for example: cloud type, wind direction, fronts, barometric pressure, **stability** of air *(tendency to rise)*

Be able to describe the general effect of barometric pressure (Low vs. High) on the expected weather (i.e., fair weather or clearing *vs.* stormy weather).

The number 1 weather-related killer is ...? The # 2 weather-related killer is...?
What precautions can we take?

Be able to describe how earth-sun relationships (shape of earth, tilt of axis) and ***albedo*** contribute to *air temperature* – with respect to *climate zones* (variation in latitude) and *seasonal differences* in an area.
Be able to briefly comment on the influence of *land mass distribution* and ***topography*** on climate
Be able to describe the influence of ***reflection*** (related to *albedo)* and ***absorption*** on the warming of the earth's surface and near-surface atmosphere; be able to discuss the role of the ***greenhouse effect***
~~Be able to distinguish the roles of **radiation**, **conduction**, and **convection** in heat transfer to warm the earth's atmosphere~~
~~Be able to describe in general terms how the various layers of the atmosphere are distinguished by temperature changes;~~
be able to describe the relationship of air pressure to altitude in the earth's atmosphere.
Be able to describe in very general terms how general characteristics of earth's *global circulation patterns,* both vertical movements (rising warm air, sinking cooler air) and surface patterns (influenced by **Coriolis effect**, etc.) affect **climate** and **weather**.

Cumulative Portion:
following are key concepts you should know for the cumulative portion of the final quiz

Be able to discuss how a ***scientific method*** is applied to the study of the earth
Be able to list key characteristics of Earth that make it unique among the planets of our solar system
Be able to discuss the earth viewed as a **system**; what does this mean, and what are the "sub-system" parts?
Be able to describe the contribution from two energy sources for our **dynamic** earth:
sun (*external*) – drives climate, water cycle, weathering
internal heat (**convection** in the mesosphere) – drives changes associated with plate tectonic system

Be able to describe how important factors affect ***weathering rates***, including:
rock type, climate (temperature, moisture), surface area, time
Be able to describe the role of **carbonic acid** in weathering, and how it is formed in nature
know that carbonic acid in rain is not the same as *acid rain*
Be able to describe the how the rate of chemical weathering can be accelerated by:
surface area, temperature, acidity (including presence of soil), rock type (chemical resistance)
Be able to define and describe ***differential weathering***, to recognize an example of this effect, and to explain the relation of rock type to differential weathering.

Be able to describe the general process of soil formation: from solid **bedrock** through the development of **soil horizons**
Be able to list/describe the 4 basic components of a true soil: **sediment**, organic material, water, air/gases

Be able to describe the sequence of sediments *(sand, silt, clay)* associated with the onshore area (beach), to the shallow sea, to deep ocean sediments: *sandstone –> siltstone –> mudstone –> limestone*
Be able to describe/interpret the significance of a series of sedimentary layers: e.g., coarse (sand) at bottom, to finer material (limestone) upward in the sequence OR from fine at bottom to coarse above, as evidence for *relative sea level changes* (***transgression***, ***regression***)
Be able to briefly list some possible causes of sea level changes relative to the land, and
Be able to explain the role of ***isostasy*** in relative sea level changes

Be able to describe, in general, the geologic approach to determining relative age of different rock units; be able to apply this approach to a *simple geologic cross-section*

Know that the age of the earth, according to geologic evidence, is **4.6 billion years**

Be able to describe, in general, the process(es) by which each of the three main types of rocks is formed:

***Sedimentary rocks*: weathering; transportation; deposition; lithification**
fossil; sedimentary environment
***Igneous rocks:* magma/ lava; crystallization; extrusive; intrusive;** effect of cooling rate
porphyritic;
Metamorphic rocks:* burial**; heat, pressure; ***recrystallization and/or ***physical deformation*** in solid state
protolith; contact metamorphism; regional metamorphism; foliation

All rocks (all 3 types) are classified/ named on the basis of their ***texture*** and ***composition***.
–>texture & composition relate to the environment/ conditions of formation for the rock; you should be able to describe an example of this relationship. Most rocks contain ***minerals*** – formed through **crystallization**. The specific mineral(s) that form is/are related to the environmental conditions (pressure, temp, and composition).

Be able to describe and/or sketch the relationship of the different rock types to one another and to earth processes – that is, how one rock can be transformed into a new rock, perhaps of a different type – the cycling of solid earth materials (...yes, that would be the "**rock cycle**").
Be able to identify the influence of ***plate tectonics*** in this process: *i.e.*, ***uplift*** *allows weathering; deep* ***burial*** *generates heat/pressure/metamorphism/melting*; these changes are key to the *rock cycle*)

Be able to describe the differences associated with different eruptive styles, including:
magma composition (**mafic** vs.**felsic** *or intermediate*), **volatile** content, temperature, **viscosity**, **plate tectonic environment**

non-violent volcanism -
associated with divergent boundaries (e.g., Iceland) and **oceanic hot spots** (e.g., Hawaii); magma is created through melting of *mantle* compositions; low viscosity, *mafic*, low gas content; *lava flows* create *shield volcanos*

explosive volcanism - associated with subduction zone convergent boundary *(examples?)*; magma has *felsic to intermediate* composition; high viscosity, high volatile content; steep-sided volcanic cone ('*stratovolcano*') created from lava and *pyroclastics* (fine ash to large 'bombs')

Be able to define/ describe, in relation to volcanic processes and environments:

pyroclastics	***pyroclastic flow***	
shield volcano	***composite cone/ stratovolcano***	***caldera***
mid ocean ridge	***subduction zone***	***convection***

Be able to explain why different areas of the world are associated with volcanoes of different eruptive styles
Be able to discuss (in general terms) where magma comes from and why volcanoes exist only in certain places around the world
Be able to describe the geologic benefits associated with volcanic environments: agriculture, energy, geologic resources (***tourism* is not a geologic benefit!);
Be able to explain how and why, for many people, benefits outweigh risk of deadly volcanoes (–> time scale)

Be able to tell how layers of the earth differ in physical behavior:
lithosphere, asthenosphere, mesosphere, outer core, inner core *vs.*
with respect to chemical composition: **crust, mantle, core**

The *distribution* of elements within the crust is not uniform: ***continental crust*** (thicker and less dense) has a different average composition than ***oceanic crust*** (thinner, more dense)
–> how do we describe those compositions?
–> how do these differences affect the types of plate interactions and plate behavior with respect to global tectonic activity?

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Be able to define the following:

earthquake ***focus vs. epicenter*** ***fault***
liquefaction ***tsunami*** ***seismic waves*** ***seismograph***

Be able to describe the technique of locating the epicenter of an earthquake:
comparing **time of first arrival** of P-wave *vs.* S-wave gives **lag time**, which tells *distance* but <u>not direction</u>; comparing data from at least **3** seismic stations pinpoints the epicenter

Be able to explain how the measure of ***intensity*** of an earthquake is different from a measure of ***magnitude***
be able to list the <u>factors</u> that affect ***intensity*** (degree of damage) of an earthquake, and recognize difference between:
geologic factors: *magnitude* of earthquake, *duration* of shaking, *distance* from epicenter, *depth* of focus, and
nature of *geologic materials* (that is, the type of rocks or sediments), *as distinguished from*
"human" factors: building design and construction, population density, even time of day
Be able to describe types of situations in which an earthquake of *moderate magnitude* might cause **greater** damage than a much *larger magnitude* quake.
be able to describe the <u>effects</u> of earthquakes, including:
geologic effects: ground shaking, ground rupture, landslides, **liquefaction**, tsunamis; *as well as*
human effects: building collapse, fires (due to ruptured gas lines), etc.
be able to describe how a *tsunami* forms. In general, what factors increase the risk of a tsunami occurring?

Be able to discuss the relationship between ***plate tectonic setting*** and depth of earthquake ***focus***, as well as magnitude of earthquakes that occur there
Be able to name the three types of plate boundaries, *describe* the relative motion and features associated with each, and recognize examples of each (e.g., from the "plate tectonic worksheet"):

- **<u>divergent</u>**: plates move apart; new oceanic lithosphere is created at a *mid-ocean ridge;* new oceanic basin is created in ***continental rift zones***
- **<u>convergent</u>**: plates move together:
  – ***subduction*** of oceanic plate pushed under a continental plate at a ***trench***: volcanic mountains are created; earthquakes at depths corresponding to subducting plate *or*
  – continents collide, creating *mountain-building zone* (no volcanism; shallow earthquakes)
- **<u>transform</u>**: plates move past each other along a *fault* – large magnitude, shallow earthquakes; no volcanism

–> Given some information about geologic processes or characteristics of a region, including rock types found, presence and type of volcanic activity and earthquake activity, you should be able to *predict* the type of *plate tectonic environment* that is represented by that region.