Some topics to study for the Midterm Exam: Geology 334

1. Global Cycles:
Water; oxygen and carbon; the rock cycle – geologic time and plate tectonics. The role of life.
Role of rivers. Calculate regional erosion rate from sediment discharge and drainage area.

2. Chemical Weathering:
Chemical wx processes: hydrolysis, dissolution, oxidation. Examples.
Controls on the rate and intensity of chemical wx: climate, composition, grain size, tectonics.
Soils = “survival assemblages”. Paleosols = ancient soils. Example from a Permian paleosol.

Siliciclastic Sediments:
Classification by texture and composition. Know grain sizes and names. Cement and Matrix.
Ternary plots. Information about source area. Major controls on sandstone composition.
Example from the Orinoco River: first-cycle quartz arenites produced by extreme chemical wx.

3. Chemical Sediments (focus on carbonates and chert):
Contrast in the chemistry of rivers vs. oceans: what is the contrast and what causes it?
Dissolution and precipitation of limestone (calcite). Carbonate equilibria. Know these reactions.
Most carbonate sediments are organic. Where and how do they form, under what conditions?
Composition and origin of chert, how and where is it formed?

4. Basics of Fluid Flow:
Density. Why are rivers such a powerful force on earth’s surface?
Viscosity: $\mu = \tau / (du/dy)$. Different types of fluids and plastics: plot and explain their behavior.
Laminar versus turbulent flow. Reynolds number (dimensionless parameter). $Re = UD\rho / \mu$.

4. Sediment Entrainment and Transport:
Particle entrainment when applied fluid forces > resisting forces. What are those forces?
Basal shear stress. $\tau_o = \rho g D \tan \theta$. What does this mean, where/how does it apply?
Hjulstrom Diagram. Why do we use it, what does it show?

Bedforms and Cross Bedding:
The basic ripple bedform, how it is formed, resulting different types of cross bedding.
Various kinds of bedforms as a function of current velocity, flow depth, grain size.
Froude number. $Fr = U / (\sqrt{gD})$. What does it represent, why is it important?

5. Mass Transport Processes (focus on sediment-gravity flows)
Most initiate with slope failures (on land or under water)
Flow transformations (esp. subaqueous): slide => slump => debris flow => turbid. current
Deposits and sedimentary structures/textures of debris flows and turbidity currents.