EXAM IV REVIEW – GG101 Dynamic Earth

Use complete sentences and sketches to answer each question below. The more information you can provide the better!

Groundwater

1. Why is Oahu Hawaii's most densely populated island?
2. What three geologically distinct regions make up the island of Oahu? Which is our youngest volcano? Which is our oldest volcano?
3. Which side of Oahu receives the most rainfall? Explain why?
4. Besides rainfall, what are other sources of water to the groundwater reservoir on our island?
5. What percentage of the water distributed over the surface of the island actually makes it into the groundwater system? In what kind of setting does water penetrate well? In what kind of setting does water run off?
6. What two features must an aquifer have to make is suitable for groundwater production? What type of lava on our island is best suited for a groundwater aquifer and why?
7. What two geologic features cause groundwater ponding on Oahu?
8. What two lines of evidence do we have that the freshwater lens on Oahu is thinning in response to over-pumping?
9. What is happening to Oahu's population and where on the island is expected to absorb the brunt of this change? Is this location well-suited to supporting a large population based on its groundwater resources?
10. What are the four industrial-scale sources of groundwater pollution on Oahu? What types of contaminants do each of these sources generate? What type of groundwater pollution may many of us be contributing to?

Surface Water

11. Approximately what percentage of Earth's water is surface water? Why is surface water nonetheless of great interest to humans?
12. Where is the maximum flow velocity in a straight stream? Where is the maximum flow velocity in a stream going around a bend?
13. Which causes more erosion and which moves faster between laminar and turbulent flows?
14. Describe the topographic differences you would expect between the area surrounding an immature stream vs. a mature stream? How does this topography affect streamflow characteristics?
15. What three factors contribute to the development of flash floods? Which of these can be controlled by humans?
16. Why will most man-made dams have only a limited lifetime? Explain the importance of base level to determining streamflow dynamics (i.e. flow speed, age of stream, sediment carrying capacity, etc.)?
17. Once a dam has been overtopped or undermined, why does it fail nearly instantaneously?
18. In a river system that has developed natural levees, where would expect to find coarse deposits? Where would you expect to find fine deposits? How does this sorting occur?
19. Describe how delta formation (for example at the mouth of the Mississippi River) naturally leads to changing delta locations over time. Where would the Mississippi River migrate to today if it weren't confined by human-created barriers?
20. Explain why the city of New Orleans is particularly vulnerable to flooding. What steps have been taken to protect the city after Hurricane Katrina? Do you think they will work?

Glaciers

21. How does a glaciated mountain valley differ in appearance from a mountain valley that was not glaciated?
22. Why is the reservoir of water stored in glaciers of particular interest to humans today? How will sea level change in response to global warming and why?
23. Where are glaciers found today? What are the two subcategories of glaciers? What percentage of Earth's land area do glaciers cover?
24. In response to what force does glacial ice deform ductiley? Over what timeframe? What factor will cause ice to deform brittley?
25. List and describe the erosional features you might expect to see in an area where alpine glaciers exist or have recently existed.
26. List and describe the erosional features you might expect to see in an area where continental glaciers exist or have recently existed.
27. Examine the photo of the drumlin in Figure 11.19 (page 258). From what direction (right or left) did the ice sheet advance in this area?
28. How does a kettle form?
29. About what percentage of Earth's land surface was covered at some time by Pleistocene glaciers? How does this compare to the area presently covered by ice sheets and glaciers?
30. Describe the ice melting positive feedback loop associated with sea ice? Why is this important today in the Northern Hemisphere? Which pole is more susceptible to climate change and why?

Climate Change

31. Why can a geologist tell us a lot about Earth's climate? What fundamental tool of the geologist is based on climate changes and how?
32. What are the three non-human (i.e. naturally-occurring) drivers of climate change that impact Earth? What timescales do they operate on?
33. Describe each of the three orbital mechanisms that contribute to changes in solar forcing on Earth? How do these interact and how have they affected ice ages over the last 500,000 years?
34. What five climate components can all climate interactions be simplified into?
35. How quickly does each component of the climate system respond to natural and human-induced forcing?
36. How have fossil fuel emissions varied with respect to global population? What are the three primary greenhouse gases associated with fossil fuel burning and agricultural practices?
37. How much have the concentrations of greenhouse gases varied in the atmosphere over the last 600,000 years? By what percentage has each of these gases increased in the atmosphere since the 1800's?
38. How is it anticipated that our global climate system is going to respond to the increase in atmospheric concentrations of greenhouse gases? Over what timeframe?
39. How is Hawaii particularly at risk from future climate change? How is Hawaii particularly at risk from future worldwide collapse of fossil fuel resources?
40. What is your plan for dealing with future climate change?