Chapter 1: Intro Stuff
1) The IPAT Equation
2) Exponential Growth of the Human Race

Chapter 2: Getting Around in Geology
1) Atoms, Elements, Ions, and Isotopes
2) What does it take to be a mineral?
3) Mineral Groups
4) The Three Types of Rocks
   a. Igneous
   b. Sedimentary
   c. Metamorphic
5) Relative and Absolute Dating and Basic Techniques
6) Case Studies
   a. Asbestos: Fact and Fiction
   b. The Litter Belt

Chapter 3: Plate Tectonics
1) Wegener and Continental Drift
2) Arthur Holmes
3) Vine, Matthews and Morley and Paleomagnetism
4) Shadow Zones
   a. Inge Lehmann: P Waves
   b. Richard Oldham: S Waves
5) Wadati and Benioff
6) Plate Boundaries
   a. Convergent
   b. Divergent
   c. Transform
7) Earth’s Structure and the Compositional vs. Geophysical Views
8) Hot Spots
9) Case Studies
   a. Exotic Terranes
   b. Visions of how the Earth works

Chapter 4: Earthquakes
1) Types of Faults
   a. Dip Slip Faults
      i. Normal
      ii. Reverse
   b. Strike Slip
      i. Right Lateral
      ii. Left Lateral
2) Measuring Magnitude
   a. Richter
   b. Moment
3) Seismic Design Considerations
   a. Ground Shaking
   b. Landslides
   c. Ground or Foundation Failure
   d. Ground Rupture
   e. Fires
   f. Tsunami
4) Four Huge Earthquakes
   a. Gujarat
   b. Alaska, 2002
   d. Northridge, CA (1994)
5) Earthquake Danger Areas
6) Forecasting of Earthquakes
   a. Statistical Analysis
   b. Geological
   c. Early Warning Systems
7) Case Studies
   a. Earthquakes, Landslides and Disease
   b. Predictable Future Shocks
   c. Rx for Failed Freeways
Chapter 5: Volcanoes

1) Who Should Worry
2) The VEI
3) Types of Eruptions
   a. Effusive
      i. Shield Volcanoes
      ii. Continental Flood Basalts
   b. Explosive Eruptions
      i. Stratovolcanoes or Composite Cones
      ii. Lava Domes
      iii. Cinder Cones
4) Benefits of Volcanic Action
5) Volcanic Hazards
   a. Lava Flows
   b. Ash Falls
   c. Pyroclastic Flows
   d. Lahars
   e. Tsunami
   f. Weather and Climate
   g. Gases
6) Mitigation and Prediction
   a. Diversion
   b. Volcano Hazards and Risk
   c. Eruption Forecasting
7) Case Studies
   a. New Zealand
   b. Montserrat
   c. CO₂, Earthquakes and Hot Water Supply

Chapter 6: Soils, Weathering and Erosion

1) Types of Mechanical Weathering
   a. Ice Wedging
   b. Sheeting
   c. Disintegration
2) Types of Chemical Weathering
   a. Hydrolysis
   b. Dissolution
   c. Oxidation
3) Weathering Characteristics of Common Rocks
   a. Granite
   b. Basalt
   c. Sandstone
   d. Limestone
   e. Shale
4) Geologic Features of Weathering
   a. Spheroidal Weathering
   b. Cavernous Weathering
5) Soils
   a. Typical Soil Profile including all horizon types
   b. Residual, Transported, Volcanic and Loess Soils
6) Soil Classification based on climate type
   a. Pedalfers
   b. Laterites
   c. Pedocals
   d. Tundra Soils
7) Soil Erosion and Mitigation
8) Expansive Soils and Permafrost
9) Case Studies
Chapter 7: Mass Wasting and Subsidence

1) Types of Flows
   a. Creep
   b. Debris Flows
   c. Debris Avalanche
2) Landslides that move as a Unit
   a. Slumps
   b. Block Glides, Block Slides or Translational Slides
   c. Complex Landslides
3) Driving Forces and Resisting Forces of Slide Mechanics
4) Factors that lead to Landslides
5) Factors that reduce Slope Strength
6) Control and Stabilization of Slopes
7) Subsidence and Mitigation
8) Case Studies

Chapter 8: Freshwater Resources

1) Freshwater Use
   a. Instream Use
   b. Offstream Use
   c. Consumptive Use
   d. Nonconsumptive Use
2) Types of Lakes
   a. Freshwater
   b. Salt Lake
   c. Playa
3) Nourishment Classification of Lakes
   a. Oligotrophic
   b. Eutrophic
   c. Mesotrophic
4) Water Tables and Terminology
   a. Aquifers
   b. Aquiclude
   c. Perched Water Table
   d. Unconfined Water Table
   e. Conflined and Artesian Wells
5) Gaining vs. Losing Streams
6) Groundwater Mining
7) Karst Terranes
8) Ground Water Pollution
9) Case Studies

Chapter 9: Hydrologic Hazards of the Earth’s Surface

1) Factors Important in a River System
   a. Velocity
   b. Discharge
   c. Cross-sectional Area
2) Alluvial Fans and Deltas
3) Factors Determining Flooding
4) Flood Types and Measurement
5) Flood Frequency and Recurrence Interval
6) Mitigation Options
7) Flood Facts and Flood Planning
8) Case Studies

Chapter 10: Coastal Environments and Humans

1) Corals and Bleaching
2) Wind Waves and their Parts
3) Tsunamis
4) Types of Beaches
5) Mitigation of Beach Erosion
6) Estuaries
   a. Coastal Plain
   b. Fjords
   c. Fault-Block
   d. Bar-Formed
7) Hurricanes and Coastal Flooding
8) ENSO and the Coastal Zone
9) Case Studies
Chapter 11: Glaciation and Long Term Climate Change

1) Alpine vs. Continental Glaciers
   a. Valley, Piedmont, and Cirque glaciers
   b. Ice Sheets
   c. Ice Caps

2) Glacial Budgets

3) Erosional Landscapes Associated With Alpine Glaciation

4) Depositional Features Associated with Glaciation

5) The Effects of Glaciation
   a. Soils
   b. Groundwater and Outwash
   c. Sea level Change
   d. Isostacy
   e. Human Transportation Routes
   f. Pleistocene Lakes
      i. Pluvial
      ii. Proglacial

6) Causes of Climate Change
   a. Variations in the Earth’s Orbit: Milankovitch-Kroll Cycles
   b. Atmospheric Gases, such as Carbon Dioxide
   c. Variations in Solar Radiation
   d. Plate Tectonic Influence
   e. Dust and Aerosols
   f. Changes in Ocean Currents

7) Evidence of Global Warming
   a. Increasing Temperatures
   b. Glacial Change
   c. Thawing of subarctic regions
   d. Rising Sea Level
   e. Biological Responses
   f. Thinning of Polar Ice Caps

8) Projections of the Scientific Community
   a. Very Probable
   b. Probable
   c. Uncertain

9) Case Studies

Chapter 12: Arid Lands and Desertification

1) Kinds of Deserts
   a. Polar
   b. Subtropical
   c. Mid-Latitude
   d. Rainshadow
   e. Coastal

2) Causes of Desertification
   a. Overgrazing
   b. Trampling by Livestock
   c. Clearcutting of Land without Restoration
   d. Surface Mining without Reclamation
   e. Depletion of Groundwater
   f. Replacement of Natural Vegetation with Cultivated Crops
   g. Soil Salinization due to Evaporation of Irrigation Water

3) Arid Regions, Winds and Human Health

4) Case Studies
Chapter 13: Mineral Resources and Society

1) Mineral Reserves vs. Mineral Deposits
2) Origins of Mineral Deposits
   a. Igneous Processes
   b. Sedimentary Processes
   c. Weathering Processes
   d. Metamorphic Processes
3) Mineral Resources
   a. Metallic Minerals
   b. Nonmetallic Minerals
      i. Industrial
      ii. Agricultural
      iii. Construction Materials
4) Mining and its Environmental Impacts
   a. Impacts of Coal Mining
   b. Impacts of Underground Mining
   c. Impacts of Surface Mining
5) Impacts of Mineral Processing
   a. Separation Methods
      i. Flotation
      ii. Gravity
      iii. Chemical
         1. Leaching
         2. Cyanide
   b. Smelting
6) Mine Land Reclamation
7) The Future of Mining
8) Case Studies

Chapter 14: Energy and the Environment

1) The Energy Equation
2) Petroleum
   a. Origin and Accumulation of Hydrocarbon Deposits
      i. Source Rock
      ii. Reservoir Rocks
      iii. Caprock
   b. Geologic Traps
      i. Structural Traps
      ii. Stratigraphic Traps
   c. Oil Production and Drilling
   d. Quality, Price and the Future of Oil
3) Coal
   a. Coalification and Rock
   b. Reserves and Production
4) Non-Conventional Fossil Fuels
   a. Tar Sands
   b. Oil Shales
5) Problems of Fossil Fuel Combustion
   a. Air Pollution
      i. Sulfur Emissions and Acid Rain
      ii. Nitrogen Oxides and Smog
      iii. Domestic Coal Burning
   b. Mine Collapses
6) Energy For the Future
   a. Direct Solar Energy
   b. Indirect Solar Energy
      i. Wind
   c. Geothermal
   d. Nuclear
   e. Energy From the Sea
      i. OTEC
      ii. Wave
      iii. Tidal Currents
7) Case Studies
Chapter 15: Waste Management and Geology

1) Municipal Waste Deposal Methods
   a. Sanitary Landfills
   b. Incineration
   c. Ocean Dumping

2) Problems of Municipal Waste Isolation
   a. Stabilization
   b. Gas Generation
   c. Leachate

3) Recycling
4) Composting
5) Hazardous Waste Disposal Methods
   a. Secure Landfills
   b. Deep-well Injection

6) Superfund
7) Nuclear Waste
   a. High Level Wastes
   b. Low-Level Wastes
   c. Mill Tailings

8) Isolation of Nuclear Waste
   a. Yucca Mountain
   b. Health and Safety

9) Case Studies

I will ask you eight essay questions from this list of topics. You will be only required to answer five of those questions. There will also be a bonus question. The essay section of the test is worth 50 points. The multiple choice part of the exam is also worth 50 points.