Geology 41: Environmental and Solid Earth Geophysics
Study Questions

The following questions are intended to help you study for the fourth quiz. The questions relate to earth magnetism, paleomagnetism, magnetic surveying, environmental magnetism and integration of geophysical techniques

The fourth quiz will be ready at 11 AM on Fri May 8 and may be taken between then and 10 AM on Friday May 15. The exam must be taken either in Earth Science 303 or the Geology Reading Room.
The exam will be closed book/closed notes- HOWEVER, you may bring one page (single-sided handwritten) of notes with you to the exam.

1) How does the earth's magnetic field vary over periods of 1 day? 1 year? 100 years? 10,000 years? > 1 Ma? What are the causes of these variations?
2) What components contribute to the magnetic field measured at any one place on the earth?
3) In what way or ways does the earth's intrinsic magnetic field (i.e., not the externally or solar induced component) deviate from an AGD (axial geocentric dipole) model field?
4) What observations have been made regarding the character of the earth's magnetic field during reversals?
5) What can we deduce about the character of the earth's core from the nature of the earth's magnetic field?
6) What is a Curie temperature? What is coercivity? How do these properties of magnetite and hematite effect the best choice of a "cleaning" method for a magnetized rock?
7) What are the processes by which a rock can acquire a permanent magnetism?
8) What is hemispheric ambiguity in paleopole determination? What is the longitudinal ambiguity in paleomagnetic determination of previous plate position?
8) Magnetic surveys provide useful information about the subsurface, but can be quite complicated to interpret. How would the interpretation of a magnetic survey in a region where the Königsberger ratio was high differ from one in a region where Königsberger ratio was low? Give examples of geological materials that commonly have a high Königsberger ratio. Low Königsberger ratio.
10) In order to quantitatively interpret magnetic surveys complex real geological structures are modelled as simple arrays of magnetic monopoles and dipoles. What would determine whether a geological structure was better fit by a monopole or a dipole? How can the following structures be represented.
    a) anticline
    b) small (100 m) ore body
    c) large (2 km diameter) mafic intrusive
    d) vertical fault separating granite and sandstone
    e) dipping fault separating granite and sandstone
11) How do variations in magnetic susceptibility in sediment arise? How do magnetic mineralogy and grain size affect magnetic susceptibility in sediments? What

magnetic property(ies) can we use to help isolate the effects of mineralogy and grain size on magnetic susceptibility?

12) How can variations in climate produce variations in magnetic susceptibility in lacustrine and marine sediments? Does a warming in climate produce an increase or decrease in magnetic susceptibility? Why/how? Does a warming always produce an increase in magnetic susceptibility? Why/why not?

13) Toxic leachate (high salinity polluted groundwater) has migrated from a landfill. What geophysical technique or techniques would you use to: (a) identify the present location of the leachate and (2) predict the direction of future migration of the leachate?

14) What are the advantages/disadvantages of using: refraction seismology, heat flow, magnetic surveying, resistivity surveying, and gravity to determine: (a) depth to bedrock, (b) depth to the water table, (c) bedrock lithology, (d) crustal thickness?