Geophysics 4133
Magnetic Instrumentation and Interpretation Name: _____
J.R. Leeman

For each of the following problems neatly show all steps of your work (partial credit may be given if your work can be easily followed). Clearly indicate your final answers and answer all parts of the question including the 'describe' and 'why' questions.

1. Answer the following concerning magnetic survey design. *(20 pt.)*

   a) Do we establish a magnetic base station? If so how is it similar to a gravity base station? How is it different?

   b) What is a tie line? Why do we need them in magnetic surveys?

   c) What is a magnetic storm? Why can we not practically collect data during a magnetic storm?

   d) What are the diurnal and secular variations? How are they different?

2. What is a gradiometer? Why do we sometimes use them instead of a regular magnetometer? *(15 pt.)*

3. Briefly describe how a type of magnetometer works, you may choose fluxgate, proton precession, or an alkali vapour magnetometer. *(15 pt.)*

4. In proton precession magnetometers we often calculate the total field based on the Larmor precession frequency (f_p) which is proportional to the total field strength. The constant of proportionality is $\frac{2\pi}{\Phi_p}$ where Φ_p is the ratio of magnetic moment to spin angular momentum of the proton ($\approx 23.4859 nTHz^{-1}$). For a measured precession frequency of 2128.95Hz calculate the total field strength. *(15 pt.)*

5. You have been asked to design a survey to examine the orientation of dikes at field camp. The terrain is relatively flat in the area of interest, so it is easy to setup a pseudo-grid. List all steps in your survey process, starting from the morning (initial steps of the day) to the end of the day (wrapping up data collection and packing up instruments). *(35 pt.)*

On my honor, I affirm that I have neither given nor received inappropriate aid in the completion of this exercise.

Name: _____

Date: _____