

**National Exams May 2015**  
**04-Geol-A7, Applied Geophysics**

3 hours duration

**NOTES:**

1. If doubt exists as to the interpretation of any question, the candidate is urged to submit with the answer paper, a clear statement of any assumptions made.
2. This is a CLOSED BOOK EXAM.  
No calculator is permitted.
3. Six (6) questions constitute a complete exam paper.  
The first six questions as they appear in the answer book will be marked.
4. Each question is of equal value.
5. Each question should take about half an hour.
5. All questions require an answer in essay format. Clarity and organization of the answer are important. Please write legibly, as we can only grade what we can understand.

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### Examination Paper

Choose six (6) of the following nine (9) questions:

1. What physical properties are important in applied geophysics? In each case, comment on the range of values and give some typical examples. Discuss the importance of physical property contrast in applied geophysics.
2. Describe the differences and similarities of seismic reflection and refraction surveys, paying attention to the fundamentals of wave propagation, data acquisition, processing and interpretation.
3. Describe how you would go about planning a magnetotelluric survey, acquiring and processing the data and then interpreting the data.
4. Describe briefly how geophysics is important in oil and gas exploration; discuss as many geophysical methods as you can and comment on their application and importance.
5. Describe the difference between time- and frequency-domain geophysical instruments and discuss their advantages and disadvantages, citing examples where appropriate.
6. Explain why the magnetic anomaly of a body varies depending on the magnetic latitude. Discuss how this complicates interpretation and describe some common methods that people use to reduce or remove these complications. Specifically discuss the strengths and weaknesses of each of these methods.
7. Discuss the many different ways of displaying and enhancing geophysical data. In each case discuss how the particular display hinders or assists in the interpretation of the data.
8. Describe some well-known tools used for geophysical well logging, including a discussion of the physical principles of each tool, how the data are acquired and interpreted. Explain the significance of the information extracted and the circumstances when this information is important.
9. A geophysical project typically comprises the following questions/steps:
  - a) What is the problem?
  - b) What are the important physical property contrasts?
  - c) What is the best survey method?
  - d) What mode of data will be collected, spacing, frequency, airborne, ground, borehole etc.?
  - e) What is the best way to process the data?
  - f) What is the interpretation methodology?
  - g) What are the conclusions?Repeat all steps if necessary.

With reference to a case history that you are familiar with, provide the answer to questions a) to g), bearing in mind that in some projects these questions are not always explicitly addressed (for example often specific types of surveys are acquired because the operator on the adjacent property acquired that type of survey).

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### Marking Scheme

Each of the six questions selected is worth 16.66 percent of the total mark.