

National University of Ireland, Galway
OLLSCOIL NA hÉIREANN, GAILLIMH

CHRISTMAS EXAMINATIONS 1ST SEMESTER 2002

3rd SCIENCE
SEDIMENTOLOGY, APPLIED GEOSCIENCE & MINERAL OPTICS(GE321)

PAPER ONE

Prof. B.P.J. Williams
Prof. Paul D Ryan
Prof. Michael Williams
Dr Martin Feely
Dr. Kate Moore
Dr. Colin Brown

Time allowed: 3 hours

Answer: 4 questions – **One** from each section plus one from any section
Allow about 45 minutes for each question

SECTION A (Sedimentology)

1. Discuss some of the uses of sedimentary geochemistry and its advantages over petrography.
2. Write a short essay on the tectonic control of sedimentation.
3. Describe the typical processes and controls that would influence the diagenesis of sediment recently deposited on an alluvial fan.

SECTION B (Applied Geoscience)

4. Write illustrated notes using ONE of the following headings:
 - Volcanic hazard mitigation.
 - Two types of ground subsidence.
 - Identification of geological features using aerial photography.

5. Answer ALL of the following. Illustrate your answers where appropriate. Allow approximately 7 minutes per question.
- (i) What is unconfined compressive strength (UCS) and how is it measured?
 - (ii) Draw a labelled graph of stress against strain for the general case where a single material has three different modes of behaviour.
 - (iii) List three types of problem soils, the damage they cause and their treatment.
 - (iv) What geological phenomena causes ground subsidence?
 - (v) Describe the materials used for making concrete.
 - (vi) Give two examples of concrete degradation and their means of identification using microscopy.
6. Write short notes on the following topics.
One page should be sufficient for each. Allow approximately 9 minutes per question.
- i) Archie's Law and the electrical resistivity of common rock types
 - ii) Basic principles of the seismic reflection technique
 - iii) Wenner, Schlumberger and dipole-dipole arrays
 - iv) Use of Ground Penetrating Radar (GPR) to monitor leaking landfill sites
 - v) Seismic refraction travel-time versus distance graph over a 2-layered earth.

SECTION C. (Mineral Optics)

7. Distinguish between isotropism and anisotropism in optical crystallography. Show how crystals are classified based upon refractive indices. Comment on why calcite (var. Iceland Spar) is noted for its double refraction.
8. Show how the interference colour chart serves to illustrate the relationship $R = (N_{\max} - N_{\min}) D$.
(R =Retardation; N_{\max} and N_{\min} = Maximum and Minimum Refractive Indices respectively ; D =Thickness of thin section)
9. Show how the polarising microscope is used to estimate the composition of Clinopyroxenes and Plagioclase Feldspars.