

# University of Dublin

## Trinity College

Matriculation Examination

Trinity Term, 2022

Geology

22 April 2022

Professor Patrick N. Wyse Jackson

---

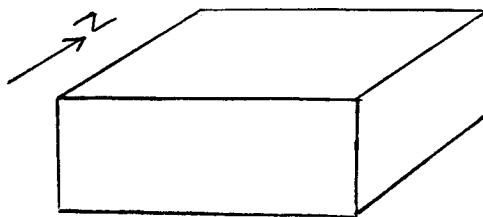
Answer only **five** questions, illustrating your answers with appropriate diagrams.

If you answer more than five questions, please note that only the first five in your script will be corrected.

Credit will be given for citing appropriate examples of geological features you have seen in the field or are familiar with.

---

1. Describe the geological processes, features, and rocks associated with the mid-Atlantic ridge, and provide a sketch cross-section across the Atlantic Ocean (15 marks). How do rocks produced at this part of the Earth's crust differ to those found in continental crust? (5 marks)
2. For the minerals in each of the following pairs, state those properties that are shared in common, and those properties (including the chemical composition) for which the minerals differ: (a) quartz and halite; (b) galena and pyrite; (c) calcite and barite; (d) gypsum and fluorite. (5 marks for each pair).
3. Draw **four** separate block diagrams viewed from the south-east (as shown) to illustrate the following geological structures: (a) strata dipping west at  $35^\circ$ , (b) strata dipping east at about  $70^\circ$  separated by an angular unconformity from younger, overlying strata that dip southeast at about  $20^\circ$ , (c) strata folded into an asymmetrical anticline that plunges at  $20^\circ$  to the north, and (d) strata dipping east at  $30^\circ$  off-set by a normal fault dipping at  $70^\circ$  to the east. (5 marks for each part).



4. Write short notes on **each** of the following topics: (a) Quarrying; (b) Coal in Ireland; (c) Oil and Gas traps; (d) Metal mining in Ireland. Illustrate your answer where appropriate (5 marks each).
5. Geologists determine past environmental conditions by closely examining the rocks formed during different geological periods. For **two** of the following geological periods: Devonian, Mississippian (Lower Carboniferous), or Paleogene (early Tertiary), describe the rocks still to be found in Ireland. Where in Ireland do they occur? What do they tell us about the past environment in which they were produced? Give the time range of the two periods you write about. (10 marks for each geological period).
6. Describe the similarities and differences between **each** of the following pairs of fossil organisms (1) Crinoids and Corals; (2) Brachiopods and Bivalves. State their mode of life, and the environment in which each generally lived. Provide a drawing of each of the four organisms and on them label their major morphological features (20 marks).

7. Write a short essay on the hydrological cycle. In it define the following terms: 'porosity', 'permeability', 'spring line', 'evapotranspiration', 'aquifer', 'artisan well' and 'ground water'. In Ireland what are the major sources of pollution in ground water? (20 marks).
8. Outline the major steps in the evolution of vertebrates (10 marks). What were the adaptations animals adopted to be able to live on land? (5 marks). What information can be gathered about animals that left fossilised trackways such as that preserved on Valentia Island? (5 marks)
9. It is thought that the oldest rock in Ireland is approximately 1,700 million years old and occurs on an island north of Donegal. Outline the evidence that geologists use to date rocks, both in (a) relative terms, and (b) in absolute ages in millions of years. What evidence in sedimentary rocks is used to determine if they are the right way-up (i.e., in their original orientation of deposition) or overturned? (20 marks).
10. Write a short essay on metamorphism. In it outline the various ways that rocks can become metamorphosed and discuss metamorphic grade. Use examples from Ireland where possible. Provide a table showing some common metamorphic rocks together with the original rock type that was altered to produce them. (20 marks).