

University of Dublin

Trinity College

Matriculation Examination

Trinity Term, 2024

Geology

20 April 2024

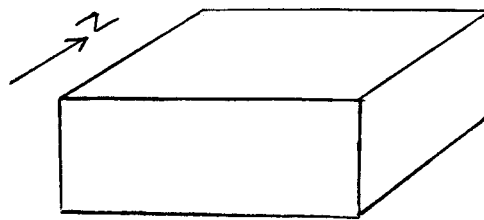
Professor Patrick N. Wyse Jackson

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 through the crust beneath and either side of the Atlantic (15 marks). How do rocks produced at this part of the Earth's crust differ to those found in continental crust? (5 marks).
2. The oldest rock in Ireland is from the island of Inishtrahull, Co. Donegal and dated at 1,779 million years old. Explain the principles of how this date was calculated (10 marks). Describe the appearance and geological origin of granite, and name and state the chemical formulae of three minerals normally present in granite (10 marks).
3. Draw **four** separate block diagrams viewed from the south-east (as shown) to illustrate the following geological structures: (a) strata dipping south-east at 25° , (b) strata dipping west at 60° and overlain unconformably by younger strata dipping 30° south-east, (c) strata folded into an asymmetrical anticline trending north-south with the east limb dipping at 70° and the west limb at 30° , and (d) horizontal strata cut by two normal faults that trend north-south to form a graben (5 marks for each part).



4. For each of the following terms associated with the hydrological cycle provide a brief definition: 'porosity', 'permeability', 'spring line', 'aquifer', 'artesian well' (15 marks). Draw and label a diagram showing the hydrological cycle (5 marks).
5. Write a brief essay on the 'Carboniferous geological period' and include information on the rocks and fossils found in Ireland that provide information on the palaeoenvironmental conditions in both the Lower Carboniferous (Mississippian) and succeeding Upper Carboniferous (Pennsylvanian) (20 marks).
6. For each of the following fossil organisms (a) Brachiopods; (b) Trilobites; (c) Cephalopods, state their mode of life, and the environment in which each generally lived (10 marks). Provide a drawing of each of the organisms and on them label their major morphological features (10 marks).

7. What evidence is there that demonstrates that Ireland was once glaciated? Discuss the evidence in Ireland, naming specific examples, for both glacial erosion and deposition (15 marks). When did the last glaciation happen, and what might have caused it? (5 marks).
8. Write an essay on the 'Evolution of Vertebrates'. What adaptations have made vertebrates successfully suited to life on land? (20 marks).
9. A friend has come to you with a collection of white to pale coloured minerals that unfortunately have become jumbled up in a box and now need to be identified. What methods would you use to identify them? (5 marks). For each of the following minerals: Calcite, Halite, Fluorspar, Gypsum, Barytes, provide information on (a) their distinguishing features, (b) give their chemical composition, and (c) suggest one commercial use for each (15 marks).
10. Write a short essay on metamorphic rocks. In it discuss the differences between Contact and Regional Metamorphism and name and briefly describe the different rock types produced under each process. Provide a table containing four different metamorphic rocks and the original rocks that were metamorphosed to produce them (20 marks).