BIRKBECK COLLEGE
(UNIVERSITY OF LONDON)

BSc. EXAMINATION

SCHOOL OF SCIENCE

Introduction to Geology – Three hours unseen examination 1 - Theory

EASC001S4

30 Credits

Monday 11 May 2020 9:30-12:30

Time Allowed: 3 hours

INSTRUCTIONS

Candidates must answer FIVE questions from ten.

Use annotated diagrams wherever possible.

Marks are indicated within the paper.

Candidates must NOT bring in any supplementary material into the examination.

1) Name and briefly describe the four major types of seismic wave and how they propagate through the Earth (8 marks). With reference to a sketch of the Earth's internal structure, describe how seismic waves have been used to help define the structure of the Earth (12 marks).

2) Describe the whole rock properties you would expect to observe in a hand specimen of gabbro (6 marks). Name the major minerals of gabbro (4 marks) and what properties each mineral should have in hand specimen (10 marks).

3) With the aid of a cross-section, **or** map of the palaeogeography, describe a major orogenic event of the Palaeozoic era (10 marks). Name any ancient oceans and land masses involved (6 marks) and the timing of the event (4 marks).

4) Describe Bowen's reaction series (10 marks) and use it along with textural information to outline a classification scheme for igneous rocks (10 marks).

5) Give an account of the optical properties in both plane polarised light (PPL) and cross-polarised light (XPL) of each of the following minerals (5 marks each):
   a) olivine;
   b) quartz;
   c) orthopyroxene;
   d) biotite.

6) Use a 2-D stress ellipse to describe how a dextral strike-slip fault may deform a circular body of rock, marking the directions of principle stress and axes of shortening and lengthening (10 marks). Mark on this diagram the orientation of the following features and briefly describe them.
   a) Veins (5 marks);
   b) Stylolites (5 marks).

7) Use temperature and pressure to outline a classification scheme for regional metamorphic rocks, marking the fields for major metamorphic facies (12 marks). Overlay this scheme with the fields for the three aluminosilicate (Al_2SiO_5) polymorphs (8 marks).

8) Give an illustrated account of **two** of the following geological features. Describe how magma is generated in each of your chosen examples and state in which tectonic setting you would expect to find them (10 marks each):

   a) Volcanic island arc;
   b) Mid-ocean ridge;
   c) Hot-spot volcanic chain.

9) Detail how plate tectonics, during the Cenozoic era, have helped push our climate into a period dominated by glacial advances (10 marks). How are the glacial and interglacial periods of the Quaternary period affected by changes in Earth's orbital parameters (10 marks)?

10) What is meant by the term ultramafic rock (6 marks)? Draw an appropriate ternary classification diagram to describe the mineralogy of peridotites (10 marks). Add an arrow to the ternary diagram to demonstrate the change in mineral composition that is believed to occur in the mantle at mid-ocean ridges during the extraction of partial melts (4 marks).