The Open University of Sri Lanka
B.Sc. Degree Programme (Level – 05)
PHU5305 – Essentials of Geology
Final Examination 2021/22

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Date: 15th October 2022 Time Allowed: 2 hours (9.30-11.30)

Paper consists of ***Six (06)*** questions. Answer ***Four (04)*** questions selecting ***Two (02)*** questions from each of the sections **A** and **B**. Answers should be illustrated with sketch maps and diagrams where appropriate. Each question carries equal marks.

SECTION A - Earth and Surface Processes

1. (i) What is the approximate geothermal gradient of the Earth? What is the pressure at the base of typical (35 km thick) continental crust? *(25 marks)*

   (ii) What are the characteristics of the Earth's crust, mantle, and core? *(25 marks)*

   (iii) Why do scientists believe the Earth's inner core is solid? *(25 marks)*

   (iv) Various transition zones in the Earth are given by the following names. Which layers of the Earth are separated by these various discontinuities?
   (a) Conorod discontinuity
   (b) Moho Or Mohorovicc discontinuity
   (c) Repiti discontinuity
   (d) Guttenberg discontinuity
   (e) Lehmann discontinuity *(25 marks)*

2. (i) Discuss the "Solar Nebular Hypothesis". *(25 marks)*

   (ii) What is the law of superposition described in geological time scale? *(25 marks)*

   (iii) Compare and contrast relative and absolute ages of rocks. *(25 marks)*

   (iv) What method of dating did geologists first use when they developed the geologic time scale? How is the scale different today? *(25 marks)*

3. (i) What are the four basic seismic wave types, and what distinguishes them from one another? *(25 marks)*

   (ii) What evidence used by Alfred Wagner to support his theory of continental drift? *(25 marks)*

   (iii) Describe type of plate moments at the following locations using your knowledge in plate tectonics.
   (a) Mid-Atlantic Ridges
   (b) Pacific ring of fire
   (c) at Himalayas
   (d) at Red Sea
   (e) at San Adreas Fault *(5 marks each)*

SECTION B – Earth Materials

4 (i) Define the term mineral? *(10 marks)*

(ii) Natural gas is a substance that occurs naturally in Earth's crust. Is it a mineral? Explain your answer. *(15 marks)*

(iii) What are the minerals or substances in the Mohs hardness scale? What is their order of hardness? *(25 marks)*

(iv) How do you identify following minerals in the laboratory/field using physical properties?

a. Pyroxene from Amphibole
b. Phlogophite from Biotite
c. Beryl from Apatite
d. Feldspar from Quartz
e. Graphite from Molybdinite *(5 marks each)*

(iv) Describe the process by which groundwater can cause erosion and deposition in limestone beneath Earth's surface. *(25 marks)*

5. (i) Basalt and granite are igneous rocks. They never contain fossils. Explain why igneous rocks never contain fossils. *(25 marks)*

(ii) Granite takes much longer to cool deep underground than basaltic or rhyolitic lava at the Earth's surface. How are the texture in granite different from rhyolite?

(iii) Explain the Bowen's Reaction Series with a suitable diagram? *(25 marks)*

(iv) Give the petrological definition for the following rocks.
(a) quartzite (b) conglomerate (c) marble (d) chert (d) granite *(5 marks each)*

6.(i) Define the process of metamorphism. And explain the different types of foliated metamorphic rocks with respect to its characteristic metamorphic grade and grain size variation. *(25 marks)*

(ii) What are non-foliated metamorphic rocks? Give two examples for non-foliated metamorphic rocks *(25 marks)*

(iii) What are the steps in forming a clastic sedimentary rock? *(25 marks)*

(iv) Describe the differences and similarities between the various types of clastic sedimentary rocks, in terms of formation environment, particle size, mineral composition, and other features. *(25 marks)*