00171

The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc. Degree Programme

Department	: Physics
Level	: 5
Name of the Examination	: Final Examination
Course Code and Title	**: PHU5305 Essentials of Geology**
Academic Year	: 2020/21
Date	: 10.12.2021
Time	: 9.30 am- 11.30 am
Duration	: 2 hours

General Instructions

- Read all instructions carefully before answering the questions.
- This question paper consists of **six (06)** questions in three (03) pages.
- Answer any **four (04)** questions only selecting **two (02)** questions from each of the sections **A** and **B**. All questions carry equal marks.
- Answer for each question should commence from a new page.
- Draw fully labelled diagrams where necessary
- Having any unauthorized documents/ mobile phones in your possession is a punishable offense
- Use blue or black ink to answer the questions.
- Circle the number of the questions you answered in the front cover of your answer script.
- Clearly state your index number in your answer script

SECTION A - Earth and Surface Processes

1. (i) How do you determine the age of rocks? *(25 marks)*

   (ii) How do we know what is the inside of the Earth? *(25 marks)*

   (iii) What is the Gutenberg discontinuity? *(25 marks)*

   (iv) Draw a diagram explaining the different layers of the earth. Give at least 3 descriptive specifics or explanatory characteristics of each of the layers *(25 marks)*

2. (i) What is plate tectonics and how is it discovered? *(25 marks)*

   (ii) Describe the three types of plate boundaries. *(25 marks)*

   (iii) Describe type of plate moments at the following locations using your knowledge in plate tectonics.
   (a) at middle of the Atlantic Ocean
   (b) in Iceland
   (c) at Himalayas
   (d) at Red Sea
   (e) at San Adreas Fault *(5 marks each)*

   (iv) Describe the contributions of studies of Earth's magnetic field to the development of plate tectonics. *(25 marks)*

3. (i) Define the action of hydrolysis during weathering processes with examples *(25 marks)*

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

   (iii) Describe what happens to each mineral within granite during chemical weathering of granite in a humid climate. *(25 marks)*

   (iv) Explain why quartz grains are 'survived' than feldspar at the surface? *(25 marks)*

SECTION B – Earth Materials

4 (i) List and briefly describe the chain silicate structures based on the SiO_4 tetrahedron. *(25 marks)*

(ii) How do you identify following minerals in the laboratory/field?

a. Pyroxene from Amphibole

b. Gold from Pyrite

c. Beryl from Apatite

d. Feldspar from Quartz

e. Azurite and Malachite *(5 marks each)*

(iii) How does 'fracture' differ from 'cleavage'? Explain the answer with Examples. *(25 marks)*

(iv) "Chert, agate and pearl are considered as mineraloids". Explain why each of them are not considered as minerals with the help of mineral definition. *(25 marks)*

5. (i) List and briefly describe the processes (or steps) involve in the formation of clastic sedimentary rocks *(25 marks)*

(ii) The Bowen's Reaction Series tell us about stability, melting temperatures and crystallization temperatures of the rock-forming silicate minerals. Using the Bowen's reaction series address the following

(a) In a basaltic magma write the first three minerals crystalize during cooling

(b) In a Solid granite which mineral start to melt first and the melting sequence *(25 marks)*

(iii) How does the rate of cooling effect crystal growth and size during the crystallization of magma or lava? *(25 marks)*

(iv) Every metamorphic rock has a parent. For each of the following metamorphic rocks, give a possible parent rock

(a) Slate (c) Quartzite (e) Greenstone

(b) Marble (d) Serpentinite

(05 marks each)

6. (i) How is foliation created during the metamorphism? *(25 marks)*

(ii) Define the following:

(a) geothermal gradient

(b) rock texture *(25 marks)*

(iii) Describe the formation of obsidian. *(25 marks)*

(iv) What are the basic structural building blocks of clay minerals?

(25 marks)