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The Open University of Sri Lanka
B.Sc. Degree Programme (Level – 05)
PHU5305 – Essentials of Geology
Final Examination 2023/24

Date: 26th October 2023 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) Why are the inner planets "terrestrial" and the outer planets "gaseous?" *(25 marks)*

(ii) Discuss the internal structure of the Earth and comment on shadow zones of S and P-waves with suitable diagrams. *(25 marks)*

(iii) How does Earth's interior work, and how does it affect the surface? *(25 marks)*

(iv) How are the Earth's crust and mantle different? *(25 marks)*

2 (i) What is the law of superposition used in geological history? *(25 marks)*

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

(iii) What is the importance of fossils when understanding the geologic time? *(25 marks)*

(iv) Why is Carbon-14 a good radioisotope for dating archaeological finds? Why is Uranium-238 a good radioisotope for dating very old rocks? *(25 marks)*

3 (i) What was Wegener's evidence for continental drift, and why was this hypothesis rejected? *(25 marks)*

(ii) According to plate-tectonic theory where is the new oceanic crust being formed? *(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)

(iv) What produces the Earth's magnetic field? *(25 marks)*

SECTION B – Earth Materials

4. (i) Your teacher gives you 2 minerals with natural crystal forms. He tells you that one is diamond and the other one is quartz. Which identification method/ property would you employ to confirm two minerals? *(25 marks)*

(ii) What is a metallic and non-metallic mineral? Give three examples of metallic and three examples of non-metallic minerals. *(25 marks)*

(iii) Write in detail about chemistry and economic importance of the Sulphide group of minerals? *(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. Galena from Pyrite

d. Feldspar from Quartz

e. Gypsum from Calcite *(5 marks each)*

5 (i) Write an essay with a labelled diagram about the Rock Cycle. Write an essay on clastic sediments? *(25 marks)*

(ii) What is the difference between breccia and conglomerate? *(25 marks)*

(iii) Discuss in detail about the formation of clay minerals. *(25 marks)*

(iv) Describe what happens to each mineral within granite during chemical weathering of granite in a humid climate. List the secondary products of each mineral if any *(25 marks)*

6. (i) How does the rate of cooling affects the crystal growth and size if igneous rocks during the crystallizing of magma or lava? *(25 marks)*

(ii) How does a felsic mineral differ from a mafic mineral? Which minerals on Bowen's Series are mafic? And which of them are felsic? *(25 marks)*

(iii) 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)*

(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)*