

The Open University of Sri Lanka

B.Sc. Degree Programme (Level – 05)

PHU 3257 – Essentials of Geology



Final Examination 2010/11

Date : 24th June 2011

Time Allowed: 3 hours (9.30-12.30)

Paper consists of Nine (09) questions. Answer *FIVE (05)* questions selecting at least *ONE (01)* question from each of the sections A, B and C. Answers should be illustrated with sketch maps and diagrams where appropriate. Each question is allocated 20 points, and the marking scheme is given in *italics*

SECTION A- Earth Processes

- (i) Describe the 'Principles of Superposition' as used in Stratigraphy? *(5 points)*
 - (ii) Describe the terms 'relative dating' and 'absolute dating' used in geological time scale. *(5 points)*
 - (iii) Describe the early and modern methods used in estimating the age of rocks? *(5 points)*
 - (iv) Suggest and describe a possible absolute dating method to calculate the ages of 'inland corals' located in the south western part of Sri Lanka. *(5 points)*
2. Explain the formation of the following landforms using your knowledge in geomorphology and tectonics.
- (i) Himalaya *(5 points)*
 - (ii) Japanese Islands *(5 points)*
 - (iii) Mid Atlantic Ridges *(5 points)*
 - (iv) Three peneplains in Sri Lanka *(5 points)*
- 3.
- (i) Suggest possible causes for the movements of the Earth plates. *(5 points)*
 - (ii) Compare oceanic crust and continental crust in terms of composition, thickness, etc. *(5 points)*
 - (iii) How and where does new ocean crust form? *(5 points)*
 - (iv) What is the Mohorovicic discontinuity (Moho), and how is the depth to the Moho determined? *(5 points)*



SECTION B – Earth Materials

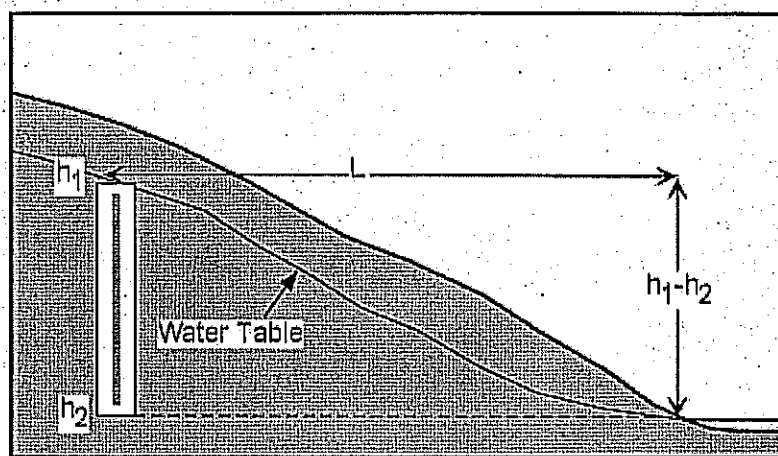
4. (i) How is a mineral defined? What are the two key-identifying characteristics of a mineral? (5 points)
- (ii) Explain the limitations of using colour as a tool in mineral identification. (5 points)
- (iii) What is the basic structural unit of all the silicate minerals? Describe the basic structural arrangements of the chain silicates. (5 points)
- (iv) How do you identify pyroxene and amphiboles in hand specimen? (5 points)
5. (i) Describe the concept of the rock cycle. (5 points)
- (ii) Plutonic rocks may be more readily identifiable in Hand specimen than volcanic rocks. Why? (5 points)
- (iii) How is the grain size of an igneous rock related to its cooling rate? (5 points)
- (iv) Cite three possible heat sources that might contribute to melting of crust. (5 points)
6. (i) What is metamorphism? What limits the maximum temperatures possible in metamorphism? (5 points)
- (ii) Describe two non-foliated metamorphic rocks. (5 points)
- (ii) On what basis are clastic sediments subdivided and named? (5 points)
- (iii) How are sediments modified as they are transported further and further from their source regions? (5 points)

SECTION C – Geological Applications

7. (i) Define and compare the properties of porosity and permeability. (5 points)
- (ii) What is an aquifer? What type of rock would make a good aquifer? (5 points)
- (iii) State Darcy's law, rearrange the equation, and explain how you would measure the hydraulic gradient of an aquifer using this method. (5 points)



- (v) A well in a confined aquifer has a surveyed land surface elevation of 32.15 m above mean sea level (MSL). The well is 101.27 m deep from the MSL Surface with a 20 m interval, and depth to water is 33.78 m. What is the total hydraulic gradient of the aquifer? (5 points)



8. (i) Define the strike and dip of a plane. (5 points)
 (ii) What is the distinction between joints and faults? (5 points)
 (iii) How do you identify dykes in the field? (5 points)
 (iv) How do you explain the formation of valley in the high-grade metamorphic terrains? (5 points)
9. (i) What is the distinction between reserves and resources? (5 points)
 (ii) Describe two kinds of magmatic ore deposits, and name one mineral mined from each. (5 points)
 (iii) What are hydrothermal ore deposits? Why are they especially associated with plate boundaries? (5 points)
 (iv) What are the two basic initial requirements for forming a fossil fuel deposit? (5 points)

