



The Open University of Sri Lanka

B.Sc. Degree Programme (Level 05) 2014/15

Final Examination

PYU3266 - Essentials of Geology

Date: 31th October 2015

Duration: 3 Hours
(9.30 am - 12.30 noon)

Paper consists of *Nine (09)* questions. Answer *Six (06)* questions selecting *Two (02)* questions from each of the sections **A, B** and **C**. Answers should be illustrated with sketch maps and diagrams where appropriate. Each question carries equal marks.

SECTION A - Earth & Surface Processes

- 1 (a) How is the time of the "Big Bang" determined? (20 marks)
- (b) What are the main supporting evidences that led to formulation of the continental drift theory? (20 marks)
- (c) Sketch a P -velocity vs. Depth profile which would result in the observed travel time curve. (20 marks)
- (d) Using the approximation that the P-wave velocity is 1.7 times faster than the S-wave velocity, estimate how long it would take for an S wave to travel 10 km (surface-to-surface horizontal distance). Assume that it reflects off the top of Layer 2. (20 marks)
- (e) Compare and contrast the concepts of uniformitarianism and catastrophism. (20 marks)
2. (a) Suggest and describe a possible absolute dating method to calculate the ages of 'inland corals' located in the south western part of Sri Lanka. (20 marks)
- (b) What do you understand by "landslides"? Discuss briefly various types of landslides. Comment on causes and remedial measures of landslides. (20 marks)
- (c) Define the following weathering processes with example for each:
 - a) Hydrolysis
 - b) Carbonation (10 marks each)
- (d) Describe the variation of slope along the longitudinal river profile with a brief note on major landforms produced along the length of a river. (20 marks)
- (e) Explain why heavy rain decreases the slope stability. (20 marks)



3. Write explanatory notes on **five (05)** of the following:

- (a) Geothermal gradient
- (b) Ring of fire
- (c) Unconformity
- (d) Generalized Soil Profile
- (e) Meteorites
- (f) Formation of waterfalls

(20 marks each)

SECTION B – Rocks & Minerals

4. (a) Define a 'mineral' according to mineralogical classification. (20 marks)

(b) You find a very salty lake that is in the last stages of drying up due to evaporation. Mention **two** halides, **one** sulphate, and **two** carbonates (names and formulae) that you might expect to find around the edges of the remaining water. (20 marks)

(c) Consider following ore minerals.

- (i) pyrite (ii) galena (iii) sphalerite (iv) rutile (v) malachite

For each ore mineral listed above, indicate its common (typical) colour as seen in hand specimen. (20 marks)

(d) For each ore mineral listed above, list element of Periodic Table for which it is a major ore mineral. (20 marks)

(e) For each ore mineral listed above, state one diagnostic physical property which may be used to identify the mineral in the hand specimen. (20 marks)

5. (a) Describe the concept of the rock cycle. (20 marks)

(b) Describe the significance of the '*Principle of Superposition*' and the '*Principle of Original Horizontality*' to relative dating of sedimentary sequences. (20 marks)

(c) On what basis are clastic sediments subdivided and named? (20 marks)

(d) Name and describe two kinds of chemical sediments. (20 marks)

(e) How are the clastic sedimentary rocks classified on the basis of their grain size? (20 marks)



6. (a) Define the metamorphism of rocks. List three (03) minerals confined only to metamorphic rocks. (20 marks)
- (b) Sketch Bowen's Series and indicates the corresponding igneous rock type that would typically form at each stage of crystallization. (20 marks)
- (c) Explain the terms 'peak' and 'retrograde' metamorphism. (20 marks)
- (d) How is the grain size of an igneous rock related to its cooling rate? (20 marks)
- (e) Plutonic rocks may be more readily identifiable in hand specimen than volcanic rocks. Why? (20 marks)

SECTION C – Geology of Sri Lanka and Mineral Resources

7. (a) What do you mean by the Pan-African event? (20 marks)
- (b) Compare and contrast the rocks from Highland Complex and Vijayan Complex in terms of age of deposition, age of metamorphism, metamorphic grade, lithology and mineral resources. (20 marks)
- (c) Describe the boundary of Highland Complex and Vijayan Complex as a guide to mineralization with reference to ore-forming processes of Sri Lanka. (20 marks)
- (d) Give a brief account on the igneous rocks found in Sri Lankan Precambrian crust. (20 marks)
- (e) Briefly outline the process of petroleum formation and maturation. (20 marks)
8. (a) Draw a sketch of subsurface profile to show aquifer conditions beneath the natural springs. (20 marks)
- (b) Joints/fractures are common in many crystalline rocks. Define these terms and explain why they are extremely relevant to groundwater exploration. (20 marks)
- (c) What is salt-water intrusion? How can it be prevented? (20 marks)
- (d) Define the terms porosity and permeability. (20 marks)
- (e) What are the major geological considerations required for construction of dam sites in Sri Lanka? (20 marks)



9. (a) What is an ore? How is its concentration factor defined? (20 marks)
- (b) What are hydrothermal ore deposits? Why they are especially associated with plate boundaries? (20 marks)
- (c) Describe the geology, tectonics and structure of Cauvery basin between Sri Lanka and India. (20 marks)
- (d) Discuss the origin of coal formation. How does its quality change with progressive heating? (20 marks)
- (e) Discuss the formation of mineral sand deposits in north-eastern part of Sri Lanka. (20 marks)

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