

University of KwaZulu-Natal, Pietermaritzburg Campus, November 2014 Examinations
School of Agriculture, Earth & Environmental Sciences
Earth Science 130 Common Rocks and Minerals (EART130P2) Theory Paper

Internal Examiner: Prof. H.R. Beckedahl
External Examiner: Prof S. McCourt

Total Marks: 200
Time: 3 Hours

This question paper consists of **TWO** pages; please see that you have **BOTH**. Answer three questions in section A, and ALL questions in Section B in the answer book provided. Use CLEAR sketches and diagrams where appropriate.

Section A – Answer any THREE of the four questions:

Question 1:

Explain the classification of sedimentary rock. Give examples of the common rock types and briefly compare the environments of deposition for each. (20)

Question 2:

The global occurrence of igneous activity is confined to plate boundaries and to intraplate regions above mantle hot spots. Write short notes outlining the different types of igneous activity associated with these different geological settings and the character and composition of the main igneous rocks produced in each setting. (20)

Question 3:

Outline the factors controlling the nature and extent of metamorphism. (20)

Question 4:

Give a detailed account of the concept of a metamorphic aureole. Use a simple sketch to illustrate your answer.(20)

Section B – Answer ALL questions:

Question 5:

a) Briefly describe the difference in formation of a clastic sedimentary rock as opposed to a chemical sedimentary rock. (6)

b) Outline the entire process of coal formation in nature, from the living plant to obtaining high grade coal. (5)

c) How would you distinguish a sandstone derived from sand deposited in a river channel from that derived from an arid environment such as a desert ? (4)

d) Distinguish between a conglomerate, a breccia and a diamictite. (9)

e) What is the difference between a calcareous sandstone and an arkose, and between a limestone and a dolomite? (4)

Question 6:

a) Briefly describe the difference between an amygdaloidal and a porphyritic texture, and explain how each of these are formed. (9)

- b) Compare and contrast a granite and a gabbro with regard to both formation and mineral composition. (4)
- c) Use a labelled diagram to illustrate three different forms of intrusive igneous bodies. (5)
- d) Briefly explain the formation and composition of an igneous layered complex. (5)
- e) Give a detailed explanation of the classification of igneous rock. Use a table to illustrate. (10)

Question 7:

- a) Name three different foliated metamorphic rocks and briefly describe the characteristic appearance of each one. (9)
- b) Explain the terms 'low' and 'high' grade metamorphic rock, and explain the most common origins of each. (8)
- c) Explain how contact metamorphism of i) limestone and ii) sandstone can take place. What are the names of the metamorphic rocks that would be produced and would you expect them to be foliated. (10)
- d) List two minerals that characterise high grade metamorphic rock. (2)
- e) Explain the term 'mobile belt' and what it signifies, and give one example of such feature in South Africa. (6)

Question 8:

- a) Carbon occurs in different forms in nature, depending on its crystal structure. Name TWO minerals consisting of carbon, and explain briefly how their properties are dependent on crystal structure. (5)
- b) Briefly explain the need for mineral identification in hand specimen. (4)
- c) Name and describe THREE of the most common rock forming minerals found on the earth's surface. (3)
- d) Explain the term 'alumino-silicate'. Why is this more common than SiO_2 ? (4)
- e) List five characteristics that may be used to identify a mineral, and describe the use of ONE of these. (7)
- f) Define the term 'mineral cleavage'. (2)
- g) List three common crystal classes, and describe any TWO of the associated crystal forms. (5)

Question 9:

- a) List and explain the dominant controls on pedogenesis. (10)
- b) Briefly explain the controls on rock weathering. (4)