

2901/104

**GEODYNAMICS STRATIGRAPHY  
AND SEDIMENTOLOGY**

**June/July 2022**

**Time: 3 hours**



**THE KENYA NATIONAL EXAMINATIONS COUNCIL**

**DIPLOMA IN PETROLEUM GEOSCIENCE**

**MODULE I**

**GEODYNAMICS, STRATIGRAPHY AND SEDIMENTOLOGY**

**3 hours**

**INSTRUCTIONS TO CANDIDATES**

*You should have the following for this examination:*

*mathematical tables/ a non-programmable scientific calculator;  
answer booklet.*

*This paper consists of **EIGHT** questions.*

*Answer question **ONE** and **FOUR** other questions.*

*Maximum marks for each part of a question are as indicated.*

*Candidates should answer the questions in English.*

**This paper consists of 5 printed pages.**

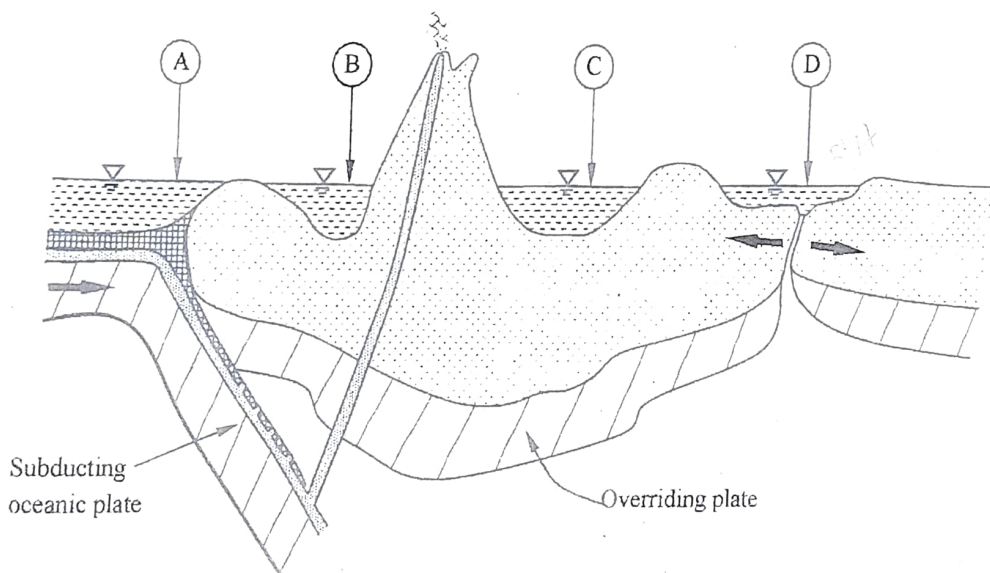
**Candidates should check the question paper to ascertain that all  
the pages are printed as indicated and that no questions are missing.**

1. (a) (i) Define a sedimentary structure.
  - (ii) With the aid of sketches, describe the following types of sedimentary structures:
    - (i) cross bedding;
    - (ii) graded bedding;
    - (iii) ripple marks.
- (15 marks)

- (b) (i) State when bedding plane structures are formed.
  - (ii) Outline **two** types of bedding plane structures.
- (5 marks)

2. (a) (i) Define sedimentary process.
  - (ii) Explain **five** factors which influence the rate of weathering of rocks.
- (12 marks)

- (b) **Figure 1** shows four types of tectonically produced basins.



**Fig. 1: Tectonically Produced Basins**

- (i) Name the basins labelled A, B, C and D.
  - (ii) Outline how each of the **four** basins in b(i) are produced.
- (8 marks)

3.

(a)

Define the following terms with reference to stratigraphy:

- (i) chronostratigraphy;
- (ii) chronostratigraphic classification;
- (iii) chronostratigraphic unit;
- (iv) chronostratigraphic horizon.

(b)

Explain each of the following in stratigraphy:

- (i) cyclostratigraphy;
- (ii) sequence stratigraphy;
- (iii) magnetostratigraphy;
- (iv) biostratigraphy.

(4 marks)

4.

(a)

With reference to geologic time scale:

- (i) define geologic time scale;
- (ii) state the **four** aeons in order from the oldest to the youngest.

(16 marks)

(b)

Explain the differences between the **four** major eras of Earth's geological history.

(5 marks)

(c)

Table 1 shows the results obtained from a stress-strain-experiment performed on a rock.

(10 marks)

**Table 1**

Stress (N/m <sup>2</sup> )	0.5	0.63	0.71	0.83	0.92	1.0
Strain	0.021	0.029	0.038	0.050	0.058	0.075

- (i) Plot a stress-strain curve for the rock.
- (ii) From the curve in (i), identify whether the rock is brittle or ductile, stating a reason for your answer.

(5 marks)

5.

(a)

- (i) Describe facies.
- (ii) Outline each of the following:

- (I) facies analysis;
- (II) facies associations;
- (III) facies successions.

- (iii) State the use of facies.

(6 marks)

(b) Explain sequence analysis. (3 marks)

(c) (i) Define a sedimentary basin.

(ii) With the aid of sketches, describe each of the following types of plate tectonic boundaries:

(I) divergent;

(II) convergent.

(11 marks)

6. (a) Explain palaeocurrent analysis in sedimentary structures. (4 marks)

(b) Referring to types of unconformities shown in figure 2.

(i) Describe an unconformity;

(ii) Explain each of the unconformities in (i).

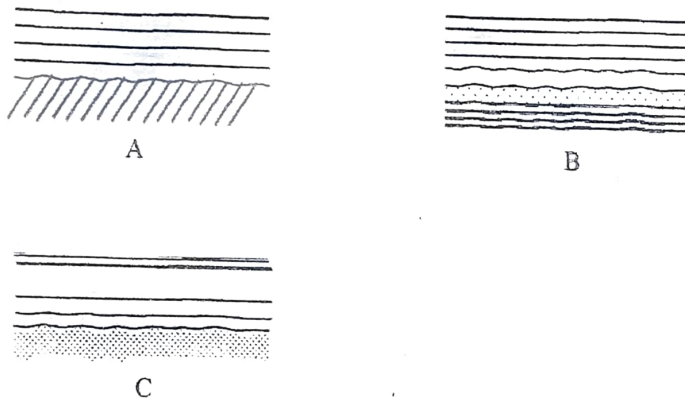


Fig. 2

(iii) Name the unconformities labelled A,B,C

(16 marks)

7. (a) Explain the classification of geological rocks. (9 marks)
- (b) (i) Define the following terms in rock minerals:
- (I) minerals;
  - (II) crystals.
- (ii) Explain the classification of minerals.
- (iii) Outline the following terms applied to crystals:
- (I) euhedral;
  - (II) subhedral;
  - (III) anhedral.
- (8 marks)
- (c) Describe colour as a physical property of a mineral. (3 marks)
8. (a) (i) Differentiate between 'streak' and 'lustre' in minerals.
- (ii) State **five** categories of lustre in minerals. (7 marks)
- (b) (i) Describe Moh's scale of mineral hardness.
- (ii) List the minerals in Moh's scale of hardness in their order of hardness. (9 marks)
- (c) Describe cleavage in rock minerals. (4 marks)

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