

2528/201
2922/201
EARTH SCIENCE AND
ENVIRONMENTAL INFORMATION SYSTEMS
June/July 2019
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY

MODULE II

EARTH SCIENCE AND ENVIRONMENTAL INFORMATION SYSTEMS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

answer booklet;

non-programmable scientific calculators.

This paper consists of TWO sections; A and B.

Answer ALL the questions in section A and any THREE questions from section B in the answer booklet provided.

Each question in section A carries 4 marks while each question in section B carries 20 marks.

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.

SECTION A (40 marks)

Answer ALL questions in this section.

1. List four basic operations of receiver component of a basic communication system. (4 marks)
2. (a) State any two platforms that can be used for ozone measurements in the atmosphere. (2 marks)
Intercept data
satellite
- (b) Describe how passive remote sensing can be used to differentiate atmospheric components. (2 marks)
Passive
3. Arrange the following atmospheric components in increasing order of their attenuation ability of radio detection and ranging (RADAR) signal: cloud droplets; hail; atmospheric gases; heavy rain. (4 marks)
4. A newly discovered planet is 14 times further from the sun as the earth is. Given that $\frac{T^2}{R^3} = 2.97 \times 10^{-19} \text{ s}^2/\text{m}^3$, predict the orbital period of the planet using Kepler's law. (Earth's distance from sun = $1.5 \times 10^{11} \text{ m}$). (4 marks)
5. Distinguish between projection and datum as used in Geographic Information Systems (GIS). (4 marks)
6. Describe the application of Global Positioning System (GPS) technology in reducing cases of livestock losses in cattle rustling prone areas. (4 marks)
7. Use a labeled diagram to describe the cross-section of earth's internal structure. (4 marks)
8. Explain why P-waves travel faster than S-waves in an earthquake incident. (4 marks)
9. Distinguish between a normal fault and a thrust fault. (4 marks)
10. Match the tectonic force with the type of rock formed as shown in table 1. (4 marks)

Table 1

Tectonic force	Type of Rock Formed
A: Extreme temperature and pressure	Igneous rock to sedimentary rock 1
B: Melting	Metamorphic rock to igneous rock 2
C: Uplift	Sedimentary rock to metamorphic rock 3
D: Weathering and erosion	Metamorphic rock to sedimentary rock 4



B-4
C-2
D-1

SECTION B (60 marks)

Answer any **THREE** questions from this section.

11. (a) List any four types of folds based on linearity of their folded strata. (4 marks)
- (b) With the aid of labeled diagrams, describe the process of forming each of the following types of rocks:
- (i) pillow structured igneous rock; (6 marks)
 - (ii) visicular structured igneous rock. (5 marks)
- (c) (i) Name the parts labeled A, B and C in the plate tectonics diagram shown in figure 1. (3 marks)

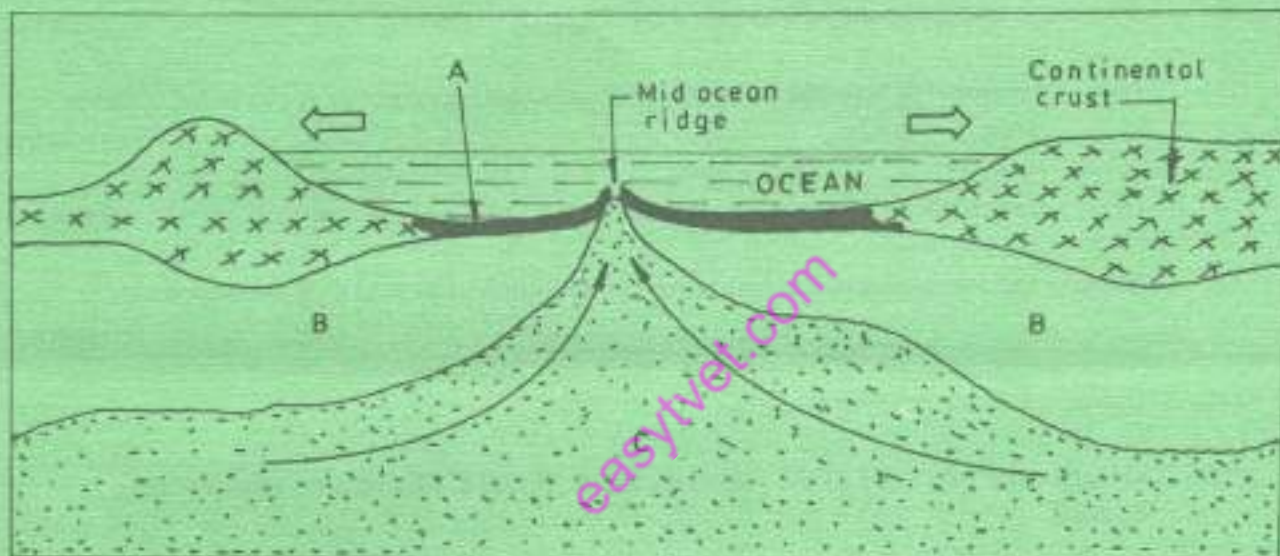


Fig.1

- (ii) Describe the phenomenon shown in figure 1. (2 marks)



12. (a) State **three** characteristic features of igneous rocks. (3 marks)
- (b) Explain the formation of the glassy-textured type of igneous rock. (4 marks)
- (c) Distinguish between connate water and meteoric water. (4 marks)
- (d) Explain the influence of the following factors on the process of weathering:
- (i) climate; (3 marks)
 - (ii) topography; (3 marks)
 - (iii) rock structure. (3 marks)

- √13. (a) Define the term 'radio detection and ranging' (RADAR). (2 marks)
- (b) Name the **two** frequency bands used by RADAR systems. (2 marks)
- (c) (i) Distinguish how the pulse doppler radar and continuous wave radar systems work. (4 marks)
- (ii) Use a labeled diagram to illustrate a RADAR pulse train. (6 marks)
- (d) Explain the formation of the bright band phenomenon in RADAR measurement. (6 marks)
- √14. (a) Define the term 'remote sensing'. (2 marks)
- (b) Describe the functions of the parts labeled A, B and C of a remote sensor shown in figure 2. (6 marks)

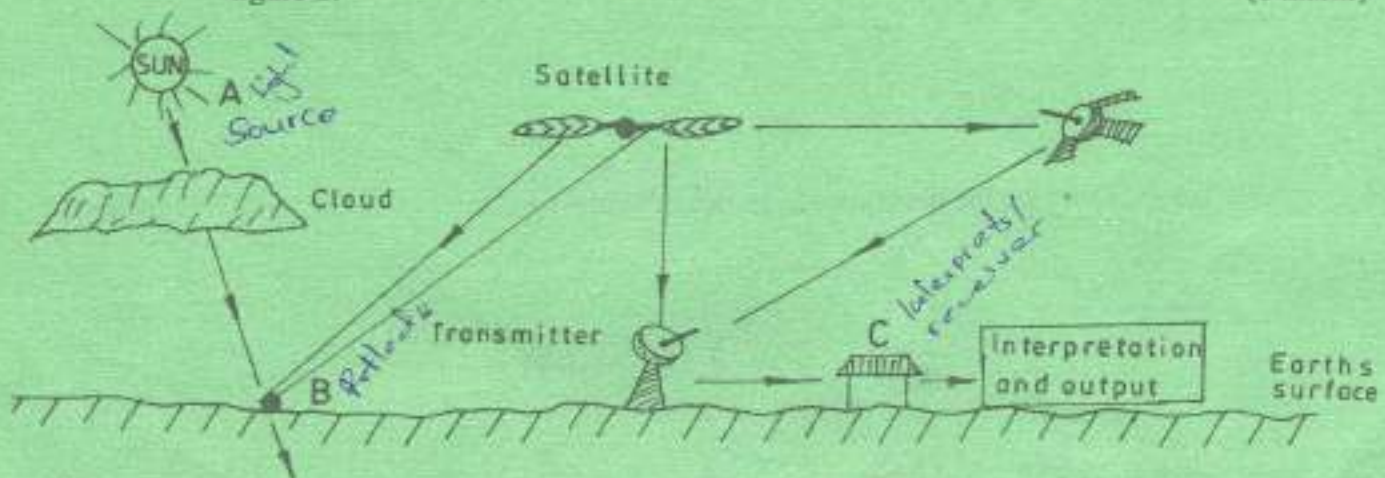


Fig. 2

- (c) Explain why most remote sensing systems do not detect and record wavelengths in the ultraviolet spectrum. (6 marks)

(d) Explain the ideal atmospheric conditions for remote sensing in the visible region of the electromagnetic spectrum. (6 marks)

15. (a) Explain the observation made on RADAR images from a maize field that has experienced flooding on some of its parts. (6 marks)

(b) Describe how a RADAR system can be used in measuring the speed of a moving vehicle. (5 marks)

(c) Describe the use of GIS in planning the harvesting of trees in a large forest. (5 marks)

(d) Describe how GPS technology can be used in monitoring wildlife in expansive areas. (4 marks)

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- A. Source of light
- B. Redirects reflected light
- C. Interprets / receiver

5

Receives raw data
Converts raw datum
Interpretation of data